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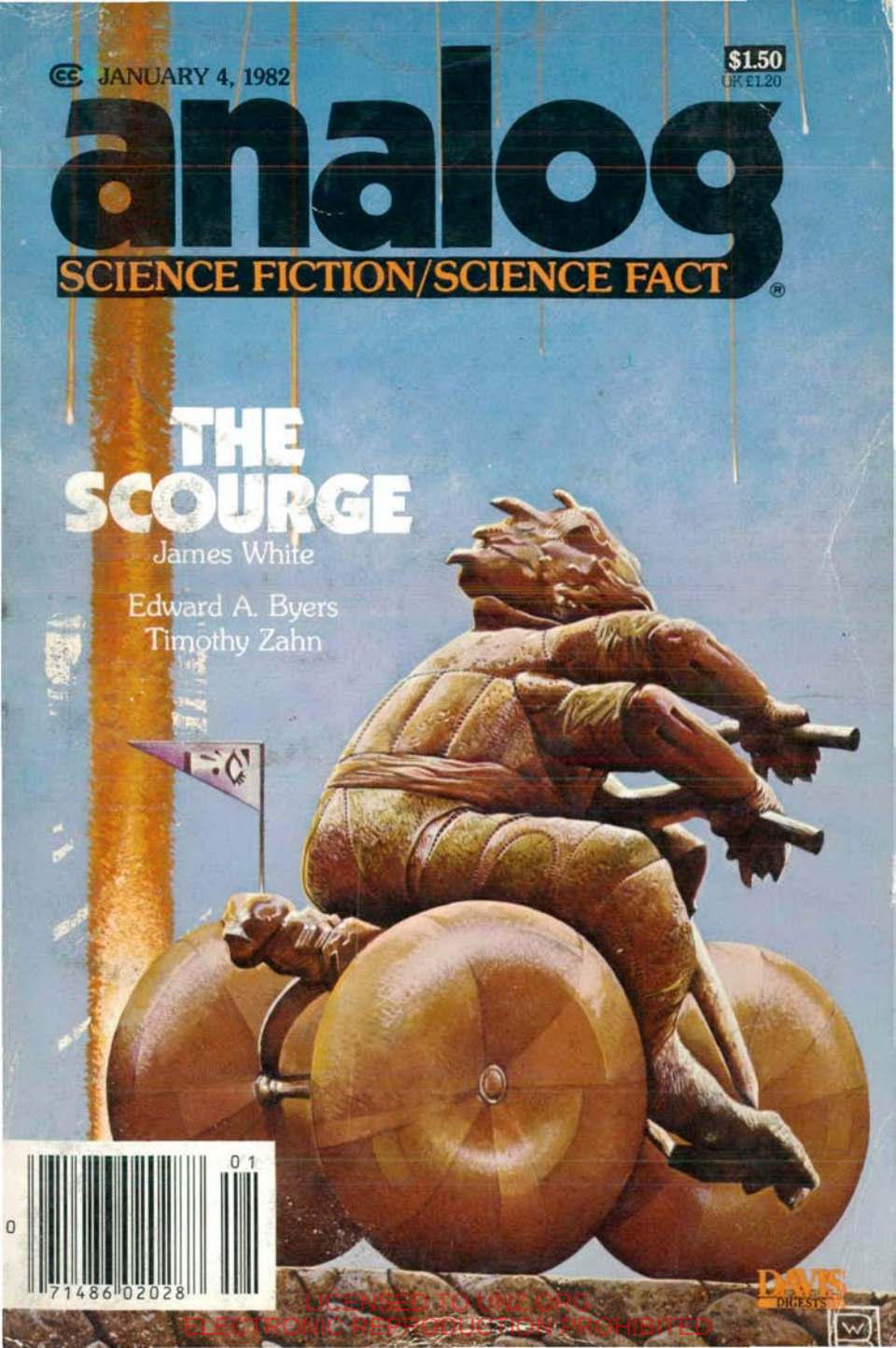

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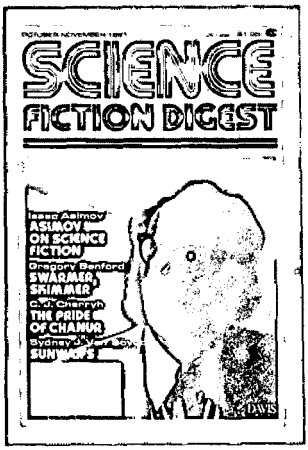

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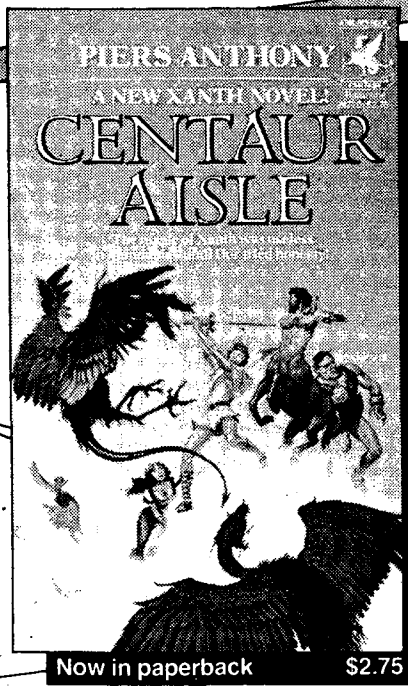

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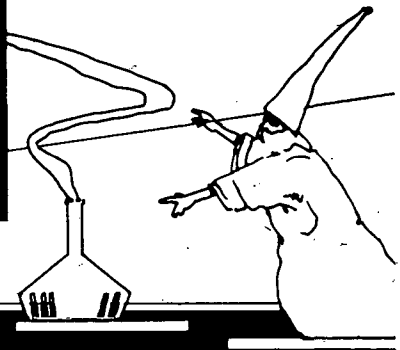

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Editorial

THE "MORAL" "MAJORITY"

Stanley Schmidt

I've been hearing a good deal lately about a group calling itself the "Moral Majority," which has taken upon itself the task of Restoring Moral Virtue to All Us Benighted Americans. Actually, there's some doubt about just who the term refers to, especially in the spoken language, where it's hard to hear the difference between capitals and lowercase initials. It seems there is an actual organization by that name, which (along with several others out to "clean up" television, schoolbooks, etc.) claims to represent a genuine "moral majority" of the people. There does, in fact, appear to be a significant following beyond the bounds of the formal organizations.

I've also been seeing a bumper sticker which offers an interesting proposition: "THE MORAL MAJORITY IS NEITHER."

My question of the month is: Is it? And if so, so what?

There's nothing new in the "moral majority" type of phenomenon, of course. It's tempting to compare the Puritans, who left religious persecution in England for freedom to persecute others in their own way. Or the witch hunters of Salem, or the Spanish Inquisitors, or the Crusaders . . .

But let's not do that. Let's be charitable and calm and simply analyze what each of those two words means, in theory and practice. Our "moral majority," after all, is neither the first nor the last in history. The questions it raises must be of direct interest to virtually any conceivable culture.

If you look up "moral" in a dictionary, you will find a multiplicity of definitions perhaps unexcelled in vagueness, circularity, and ambiguity. My Funk and Wagnalls lists nine adjectival definitions, most of which will send you scurrying to look up other words which will eventually lead you right back where you started. So does the larger *Webster's New International*. The definition which appears closest to what the "moral majority" spokespeople are

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talking about is given by Webster as, "Conforming to a standard of what is good and right; righteous; virtuous; as, *moral* conduct; a *moral* life; a *moral* work of art."

In fact, this seems to be *exactly* what they mean.

The catch, of course—the word wherein all the pitfalls lurk—is "a." *A* standard of what is good and right. The trouble, as anyone must realize who has studied either ethics or anthropology beyond the level offered by the local Sunday school, is that there exist a great many standards of what is good and right, both individual and cultural—and every one of them is fervently believed by *somebody* to be *the* standard of what is good and right.

So how do we decide whether any one of them is *the* standard? Or does the question itself make any sense?

I suppose this is the place for the obligatory disclaimer. In objecting to those who most loudly call for "morality," I am not advocating "immorality." (There are, in fact, quite a few actions which I personally consider undesirable or inadvisable, though I could not presume to forbid others to do them.) I am simply recognizing that the issues under discussion are not simple and do not have generally agreed-upon answers—and that that voice which cries loudest is not necessarily thereby qualified to impose its will on all others.

At the same time, I also recognize that it is seldom in the best interests of a society or its members to pretend that all conceivable standards are equally valid. That dodges questions which are too important to dodge—and in extreme cases, that course can be clearly self-destructive. Personally, I try to be pretty tolerant—but I freely admit that my tolerance does not extend even close to a sniper who claims a Divine Mandate to shoot Undesirables from a grain elevator or a steeple. Like Jefferson, I tend to believe that "That government is best which governs least"—but not to the extent that it abdicates its basic responsibility of protecting its citizens from flagrant offenses by others. Survival of a form of society recognizable as "civilized" seems to require, rather generally, *some* agreement on what kinds of behavior are acceptable, and control of unacceptable forms by law or custom or both.

The *nature* of that agreement may vary quite widely with the circumstances and needs of a particular society. It's a little hard to imagine a viable civilization which cheerfully accepts indiscriminate murder, but relatively easy to think of one which uses polygamy, nudism, or cannibalism. (In fact, examples of all of those exist right now, right here on Earth—though outsiders are quick to dismiss them as "primitive.") There may be at least as much danger in trying to force agreement on too many details as in not trying to define any limits at all. Some of what I do is simply none of your business, and vice versa. And societies *need* to encourage variety and experimentation for bluntly practical reasons of survival value. Like species and individuals, cultures must adapt to changing conditions, and that means they must continually try out not only new "practical" ideas such as manufacturing methods, but new ways of liv-

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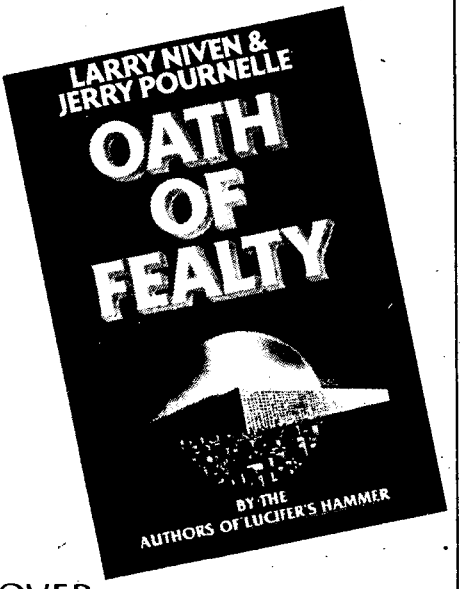

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ing—new social mechanisms and value systems—which may serve better in some future circumstances.

Let me evade, for now, the question of what the agreed-upon standards should be, and turn instead to the second word of my original topic. Considering the significance of "majority" may help to narrow the field for "basic morality."

Clearly, the Moral Majority—with caps and formal organization—is *not* a majority, or anything like one. Proving that is a simple matter of counting and arithmetic. But how about the "moral majority" (no caps), that shadowy mass of people which these organizations claim to represent? Are *they* a majority?

I don't know. Nor do I care. Even if they *were* a majority, would that make it "right" for them to dictate as much as their spokesmen would like of the private behavior of others?

Analog: If the majority of a mob wants to lynch a man because of his skin color or his dietary preferences, is *that* right? Is it any more so if the mob happens to be a genuine majority of the local population?

The concept of "majority" has acquired a peculiar (and inconsistently applied) sanctity hereabouts. Not entirely without reason, I hasten to add—in a great many cases *involving* most people, majority rule does have certain features that make it at least emotionally more appealing than trusting all decisions to a monarch. In decisions principally of opinion or taste, with clearly communal impact (such as what kind of road system to build, or whether to use a piece of land as a park), majority rule offers a way to find an answer that

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satisfies, at least approximately, as many as possible of the people affected. (Or, at the very least, to let them share the blame for mistakes.)

The trouble, as with many good ideas, is that people latch onto something which is very good for one class of problems—and try to apply it indiscriminately to everything in sight. Popular democracy (even in the considerably modified form we have) is indeed a hard-earned right which people are quite correct to guard and use—*for questions of opinion whose outcome affects all the voters*. But no less important than recognizing what a tool is good for is recognizing what it is *not* good for—and there are areas in which majority rule is very hard to justify.

Questions of fact, for instance. I don't care how unanimously a legislature or populace may vote to set *pi* equal to 3.000 . . . . —it just ain't so, and it never will be. It's 3.1415926536 . . . . , for completely external reasons, and there's nothing you can do about it. A bunch of scientific ignorami may vote to consider "scientific creationism" of equal scientific validity with the concept of evolution, but that won't change the relative weights of the accumulated evidence. (It will, however, force conscientious teachers to prostitute themselves, to keep bread on the table, and raise up a generation of confused, ignorant children—who will ultimately turn into confused, ignorant, voting adults.)

Another big area where majority rule has no business is that of questions which may involve only opinion or taste, *but involve only certain individuals*. Few of us would be willing to have a majority vote determine what doctor we go to, or what shoe size we wear, or who we marry. None of these choices has consequences *absolutely* limited to the individuals involved—a person wearing uncomfortable shoes, for example, may be irritable and hard to get along with. But their effects on others are, in general, so indirect, so unpredictable, and so much less than their direct effects on the participants, that it is very difficult to justify letting anyone but the participants have a voice in them.

What people read or watch on television or otherwise do for fun in their living rooms or bedrooms is not fundamentally different. As long as they have no significant, clearly traceable effects *outside* people's homes, these things are simply not the majority's business. Individuals who value freedom are quite right to resist tooth and nail the efforts of any self-appointed, self-righteous vigilantes to control these areas. (But then, individuals who value freedom—who *really* value it, even for other people—seem always to have been in rather short supply.)

All of this leads back to the question of what morality a society *can* require for its own maximum benefit—bearing in mind that that benefit must ultimately be measured, in large part, by the well-being and happiness of its individual members. It's a knotty question, and if it has any answers which are truly simple in practice, I haven't seen them. However, I have seen one basic moral principle which I can accept as a good general guideline for both individual and collective action (though I can't

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claim credit for originating it).

It grows out of considering one basic question: given the diversity of beliefs about how beings should act, when can I justify interfering with the actions of another sentient being? (And, conversely, when must I admit that another sentient being is justified in interfering with *my* actions?) There has never been a shortage of groups willing to claim Divine Mandate or something similar for their particular codes—but until they can produce more indisputable documentation than they have managed so far, I can certainly sympathize with those potential converts who say, "I'll stick to my own, thank you." What we need is a criterion for interference which does *not* depend on one being's accepting another's beliefs on faith—something which justifies bringing others into the picture because of an objectively identifiable and logically defensible interest in the outcome.

On this basis, the only general situation I can see in which I can justify interfering with you is when you are interfering with—or hurting—someone else. Hence this general guideline, which is almost the only one I have heard which I could seriously advocate for general adoption: "Anyone should be free to do anything he wants *unless it hurts someone else.*" There, and no sooner, freedom ends.*

Lots of people claim to believe this (a lot fewer apply it consistently to actual cases of other people doing things they personally dislike.) The principal advantages of such a creed are that it minimizes arbitrary restrictions and judgments and maximizes opportunities for diversity in living—and, consequently, the experimentation I men-

*Children, it may reasonably be argued, are an exception—if they're allowed to do everything they want while they're still learning how the world works, too few may survive to adulthood. Or if they do, they may be insufferable by the standards of this or any other guideline.

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tioned earlier as the raw material of social evolution. It imposes enough restriction to provide a basis for reasonable peace and order—and I, at least, find it hard to justify any further restriction except in notably special circumstances.

The practical difficulties, of course, are sizable. A large percentage of them are matters of interpretation. What constitutes a "hurt"? (Physical, mental, and economic examples spring immediately to mind.) How clearly must the hurt derive from external rather than internal causes? (If I have a relative who routinely misconstrues any remark into a personal insult, am I responsible for the offense he or she takes at my words?) Should action be taken against acts which *could* cause harm, or only (after the fact) against those which *do*? To what extent is a person responsible for distant "ripple" consequences of his actions? What *kinds* of action should be taken when some kind is warranted? If (as often happens in practice) all the options in a situation involve hurting *somebody*, how do you decide which injuries are least objectionable?

Nobody said this was going to be easy. We have a large body of law because human interactions are complex and highly variable. Any basis you propose for an ethical or legal system, I suspect, will be fraught with difficulties of detail in applying it to every conceivable case. Nevertheless, a good one can be very useful as a general *guideline* to individual and group behavior.

I challenge any and all to consider the practical difficulties in applying the one proposed here—*and how to solve them*. Or, if you prefer, to propose *better* fundamental principles that are easier to live with and/or better for a society.

Meanwhile, *if* you accept this one as a working approximation to a basic moral code—with its logical implication that "immoral" means "interfering with other people for any reason other than this one"—then the efforts of "moral majorities" to dictate private conduct are clearly and flagrantly *immoral*.

And, as even they would surely agree, we don't want a lot of immorality in our midst. Do we? ■

● To those who do not know mathematics it is difficult to get across a real feeling as to the beauty, the deepest beauty, of nature. C. P. Snow talked about two cultures. I really think that those two cultures separate people who have and people who have not had this experience of understanding mathematics well enough to appreciate nature once.

RICHARD FEYNMAN

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James White

THE SCOURGE

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The ways of any culture are likely to look strange and distasteful to a member of any truly different one.
But within their own context...

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During the third year at the Galactic Federation's preliminary training school for Earth-human non-Citizens on Fomalhaut Three, they had watched their classmates disappear, two by two, in the directions of their chosen specialties.

The trouble was, Martin thought as he signalled their presence and readiness to begin the day's work, that neither Beth nor he had shown any strong preferences or special aptitudes for the positions being offered. They had decided that their tutor just did not know what to do with them.

Having arrived at that decision, it was inevitable that the great, sprawling, slimy and multi-tentacled horror responsible for their training would show them yet again that their thinking was in error.

GOOD MORNING, said their desk displays. ASSIGNMENT INSTRUCTIONS FOLLOW. PLEASE RECORD FOR LATER STUDY.

With the appearance of the words, the wall facing them became a screen depicting in unpleasantly fine detail their tutor and the large, low-ceilinged, and dimly lit compartment in which it lived—or perhaps only taught. It was surrounded by two small consoles and eight untidy heaps of garishly colored material which Martin had thought at first were art objects or furniture but had later decided, after seeing the creature holding one of them close to one of its many body orifices, that they were more likely to be food or a collection of aromatic vegetation.

The upper and lower lids opened to reveal a single eye, which looked like a fat, transparent sausage in which two pupils moved independently to regard them. Their desk displays lit with a new message.

SUMMARY OF ASSIGNMENT. YOU WILL PROCEED TO THE SYSTEM LISTED AS TRD/5/23768/G3 AND TAKE UP ORBIT ABOUT THE FOURTH PLANET. STUDY IT, INTERVIEW A MEMBER OR MEMBERS OF ITS DOMINANT LIFE-FORM, AND ASSESS THIS SPECIES' SUITABILITY OR OTHERWISE FOR CITIZEN MEMBERSHIP OF THE GALACTIC FEDERATION.

QUESTIONS?

Martin swallowed. He knew that the feeling was purely psychosomatic, but it felt as if his stomach was experiencing nil-G independently of the rest of his body. At the adjoining desk, Beth was putting on her spectacles. She did not need them or any other sensory aid, for that matter, because all of the Earth-human trainees already had received the benefits of the Federation's advanced medical and regenerative procedures so that they were as perfect physiologically as it was possible for a member of their species to be. But at times of stress Beth wore her glasses because, she insisted, they made her feel more intelligent.

"No questions," she said quietly, glancing at Martin for corroboration. "Until more data is available on the assignment, questions at this stage would tend to be simply requests for more information."

VERY WELL. IT IS CALLED TELDI IN THE LANGUAGE MOST WIDELY USED ON THAT WORLD. IT IS A DANGEROUS PLANET AND CONSIDERED SO EVEN BY ITS INHABITANTS, WHO LIVE ON A LARGE EQUATORIAL CONTINENT AND A CHAIN OF ISLANDS WHICH LINK IT TO THE NORTH POLAR LAND MASS. TECHNOLOGICALLY ITS CULTURE IS NOT ADVANCED.

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TELDI WAS DISCOVERED BY A FEDERATION SEARCHSHIP TWENTY-SEVEN OF YOUR YEARS AGO. BECAUSE OF GROSS PHYSICAL DIFFERENCES BETWEEN THE TELDINS AND THE SPECIES MANNING THE VESSEL NO OVERT CONTACT WAS MADE.

QUESTIONS?

There was a very obvious question, and Martin asked it. "If direct contact could not be made because the searchship personnel were too visually horrendous so far as the Teldins were concerned, why was indirect contact not tried by translated visual word displays as was done on Earth, and as you are doing here?"

TELDINS WILL NOT DISCUSS MATTERS OF IMPORTANCE OR MAKE MAJOR DECISIONS THROUGH INTERMEDIARIES LIVING OR MECHANICAL. DISCOVERING THE REASON FOR THIS BEHAVIOR IS PART OF YOUR ASSIGNMENT.

"Then we shall be meeting them face to face," said Martin, wondering where all his saliva had gone. "May we see one of the faces concerned?"

OBSERVE.

"No doubt," said Beth in a shaky voice, following a three-second glimpse of the being, "they have beautiful minds."

THE MATTER TRANSMISSION NETWORK WILL NOT INCLUDE TELDI UNTIL A FAVORABLE ASSESSMENT HAS BEEN MADE. YOUR TRANSPORTATION WILL BE BY HYPERSHIP. DURING SURFACE INVESTIGATIONS BY THE ENTITY MARTIN THE ENTITY BETH WILL REMAIN WITH THE SHIP IN A SURVEILLANCE AND SUPPORT ROLE.

QUESTIONS?

Martin lifted his eyes to stare at the monstrosity beyond the desk screen, feeling himself beginning to sweat. He said, "This . . . this is a very important assignment."

THAT IS A SELF-EVIDENTLY TRUE STATEMENT. IT IS NOT A QUESTION.

Beside him Beth laughed nervously. "What he was trying to say, Tutor, is why us?"

THREE REASONS. ONE, YOU HAVE BOTH SHOWN ABILITY ABOVE THE AVERAGE COUPLED WITH COMPLETE INDECISION REGARDING YOUR FUTURE. WHETHER OR NOT IT IS COMPLETED SUCCESSFULLY, THIS ASSIGNMENT WILL ELIMINATE SEVERAL FUTURE POSSIBILITIES. TWO, AS MEMBERS OF THE SPECIES MOST RECENTLY OFFERED FEDERATION CITIZENSHIP, YOUR KNOWLEDGE AND UNDERSTANDING OF WHAT IS INVOLVED IN MAKING THIS ASSESSMENT WILL BE GREATER THAN THAT OF LONG-TERM MEMBERS. THREE, THERE ARE REMARKABLE SIMILARITIES BETWEEN THE TELDINS AND THE EARTH-HUMAN SPECIES WHICH SHOULD EASE YOUR COMMUNICATION PROBLEMS.

"Apart from breathing a similar atmosphere," Beth protested, "there is no resemblance at all. They are unbeautiful, completely lacking in esthetic appeal, visually repellant and—"

YOUR PARDON. I HAD THOUGHT THAT THE DIFFERENCES WERE SUPERFICIAL.

To you, thought Martin, *they probably are.*

YOU WILL ALREADY HAVE REALIZED THAT YOU ARE BOTH TO UNDERGO IMPORTANT FITNESS TESTS, AND THE VALUE OF THESE TESTS WOULD BE DIMINISHED IF I ASSISTED YOU OTHER THAN BY PROVIDING THE BASIC INFORMATION.

QUESTIONS?

"Can you give us advice?" he asked.

OBVIOUSLY. YOU HAVE BEEN RECEIV-

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ING ADVICE, GUIDANCE, AND INSTRUCTION FOR THE PAST THREE OF YOUR YEARS HERE. MY ADVICE IS TO REMEMBER EVERYTHING YOU HAVE BEEN TAUGHT AND PUT IT INTO PRACTICE. THE ASSIGNMENT NEED NOT BE A LENGTHY ONE PROVIDED THE ENTITY BETH USES ITS BRAIN AND THE SHIP'S SENSOR AND COMPUTER FACILITIES EFFECTIVELY AND THE ENTITY MARTIN IS CAREFUL IN ITS CHOICE OF FIRST CONTACTEE AND THE SUBSEQUENT INTERROGATION.

IT IS POSSIBLE TO ARRIVE AT A FULL UNDERSTANDING OF A CULTURE FROM THE INTERROGATION OF ONE OF ITS MEMBERS. ALL THE NECESSARY EQUIPMENT IS AVAILABLE TO YOU. YOU HAVE BEEN FULLY TRAINED IN ITS USE. WHILE YOU ARE DECIDING ON THE SUITABILITY OR OTHERWISE OF TELDI FOR FEDERATION MEMBERSHIP, WE SHALL BE DECIDING ON YOUR SUITABILITY FOR DUTY AS A HYPERSHIP CAPTAIN AND A CONTACT SPECIALIST.

THE RESPONSIBILITY IS ENTIRELY YOURS.

The system had seven planets, and its only inhabited world, Teldi, was encircled by the broken remnants of a satellite which had approached within Roche's Limit and been pulled apart by the gravity of its primary. The planet had no axial tilt, and the orbit of the moon had coincided with its equator. The orbiting and constantly colliding debris had not yet formed into a stable ring system, so that the equatorial land mass of Teldi was swept by a light meteorite drizzle which was seeded with enough heavier stuff to make life very uncertain for anyone who remained for long periods in the open.

"It wasn't always like this," said Martin, pointing at one of the sensor displays they had been studying. "That grey strip with the old impact craters all over it was an airport runway, and those heaps of rubble and corrosion could only be dockyard facilities and industrial complexes. This culture must have been as advanced at least as that of pre-Federation Earth before their moon broke up."

"It may have been more than one moon," said Beth thoughtfully. "The orbital paths and clumping of the orbiting debris indicate a—"

"The difference is academic," Martin broke in. "What we have here is a once-advanced culture which has been hammered flat by meteorite bombardment to the extent that they have regressed to a primitive farming and fishing culture. Except for the polar settlement, which is virtually free of meteorites, their past technology seems to have been lost. The question is, where do I land?"

Beth displayed a blow-up of the polar settlement with the relevant sensor data. It was a scientific establishment of some kind, with a small observatory, a nonnuclear power source, and a well-built road which was obviously a supply route. Communicating with the inhabitants should be relatively easy, Martin thought, because the astronomers among them would be mentally prepared for the idea of extra-terrestrial (to them) visitors. But they would not be typical of the population as a whole.

An assessment should not be based on a species' intellectuals alone. He had to talk to the Teldin equivalent of an ordinary man in the street.

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The landing site finally agreed upon was by a roadside some ten miles from a "city" which lay on and under the floor and walls of a deep, fertile valley on the equatorial continent.

"And now," said Beth, "what about protection?"

For several minutes they discussed the advisability of using the ship's special protection systems while he was on the surface, then decided against them. He had to make contact with a technologically backward alien, and he would do himself no good at all by frightening it with gratuitous demonstrations of super-science.

"Right, then," he said finally. "My only protection will be the lander's force shield. I won't carry anything in my hands, and wear uniform coveralls and an open helmet with image-enhancing visor, and a Teldin-type backpack with a med kit and the usual supplies. The Teldins seem pretty flexible in the matter of clothing, so I would be displaying my physiological differences as well as showing them that I was unarmed.

"The translator will be in my collar insignia," he went on, "and the helmet will contain the standard sensor and monitoring equipment, lighting, and a facility to enable me to bypass the translator so that we can speak without being understood by listening Teldins. Can your fabricator handle that?"

Beth nodded.

"Have I forgotten anything?"

She shook her head.

"Don't worry about me," he said awkwardly, "everything will be just fine."

But still she did not speak. Martin reached toward her and carefully removed her glasses, folded them, and placed them on top of the control console.

"I'm ready to go," he said, then added gently, "sometime tomorrow . . ."

Martin made no secret of his landing. He arrived at night with the lander's external lights ablaze, coming in slowly so as not to be mistaken for one of the larger meteors. Then he waited anxiously for the reaction of the inhabitants and authorities of the nearby city.

With diminished anxiety and growing impatience, he was still waiting more than a full Teldin day later.

"I expected crowds around me by now," Martin said in bafflement. "But they just look at me as they pass on by. I have to make one of them stop ignoring me and talk. I'm leaving the lander now and beginning to move toward the road."

"*I see you,*" said Beth from the hypership, then added warningly, "*The chances of you being hit during the few minutes it takes you to reach the protection of the road are small, but even our super-computer cannot predict the impact point of every meteorite.*"

Especially the odd ones which were the result of collisions in close orbit, Martin thought, and which dropped in at a steep angle instead of slanting in from the west at the norm of thirty degrees or less. But the odd behavior of the satellite debris which fell around and on Teldi, and which offended Beth's orderly mind, faded as he thought of meeting his first Teldin.

It would be a member of a species which had advanced perhaps only to the

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verge of achieving spaceflight, and which still practiced astronomy in that dark, polar settlement. Such a species would have considered the possibility of off-planet intelligent life. Perhaps the idea might exist only in Teldin history books, but an ordinary Teldin should be aware of it and not be panicked into hostile activity by the sight of a puny and obviously defenseless off-worlder like Martin.

It was a nice, comforting theory which had made a lot of sense when they had discussed it back on the ship. Now he was not so sure.

"Can you see anyone on the road?"

"Yes. Just over a mile to the north of you, heading your way and toward the city. One person riding a tricycle and towing a two-wheeled trailer. It should be visible to you in six minutes."

While he was waiting, Martin tried to calm himself by examining at close range a stretch of the banked rock wall which ran along the side of the road. Like the majority of the roads on Teldi this one ran roughly north and south, and the wall protected travellers from the meteorites which came slanting in from the west.

The banked walls were on average four meters high and built from rocks gathered in the vicinity. The roads were rarely straight, but curved frequently to take advantage of the protection furnished by natural features such as deep gullies or outcroppings of rock. When east-west travel was necessary, the roads proceeded in a series of wide zigzags, like the track of a sailing ship tacking to windward.

The sound was like a short, sharp hiss and thud, and midway between his lander and the road there was a small, glowing patch of ground with a cloud of rock dust settling around it. When he looked back to the roadway, the Teldin was already in sight, pedalling rapidly toward him and hugging the protective wall.

Martin walked to the outer edge of the roadway to get out of its path. He did not know anything about the oncoming vehicle's braking system, and it was possible that he was in greater danger of being run over by an extraterrestrial tricycle than being hit by a meteorite. His action could also, he hoped, be construed as one of politeness. When the vehicle slowed and came to a halt abreast of him, he extended both hands palms outward from his sides, then let them fall again.

"I wish you well," he said softly. Loudly and clearly and taking a fraction of a second longer, his translator expressed the same sentiment in Teldin.

It looked like a cross between an overgrown, four-armed kangaroo and a frog which was covered overall with sparse, sickly yellow fur. Because of the being's size and his own lack of defensive armament, Martin was acutely aware of the other's long, well-muscled legs, which terminated in large, clawed feet, and of the enormous teeth which showed clearly within the widely opened mouth. Its four, six-fingered hands also had heavy boney terminations which had been filed short and painted bright blue, presumably to aid the manipulation of small objects and for purposes of decoration. It was wearing a dark brown cloak of some coarse, fibrous material, and the garment was fastened

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at the neck and thrown back over the shoulders, where it was attached in some fashion to the being's backpack, probably to leave its limbs free for pedalling and steering its vehicle. There was no doubt, therefore, that this was a civilized entity, and that the open mouth with its fearsome display of teeth was simply a gape of surprise and curiosity, not a snarl of fury presaging an attack.

Perhaps there was a little bit of doubt, Martin thought nervously, and spoke again.

"If you are not engaged in urgent and important business," he said slowly while the translator rattled out the harsh, guttural gruntings and gobblings which were the Teldin equivalent, "I would be grateful if you could spare some of your time talking to me."

The Teldin made a harsh, barking sound which did not translate, followed by other noises which did. They sounded in his ear-piece as, "The conversation is likely to be a short one, stranger, if you do not move over here to the protection of the wall. Naturally I would be delighted to talk to you about yourself, the mechanism yonder in which you arrived, and any other subject which mutually interests us. But first there is a question. . . ."

The being paused for a moment. There was no way that Martin could read its facial expression on such short acquaintance, but from a certain tension and awkwardness in the way the Teldin was holding its limbs and body, he had a strong impression that the question was an important one. Finally, it came.

"Who owns you, stranger?"

Be careful, thought Martin. The alien's understanding of the word "own" might be different to Martin's. Could the question involve patriotism, or loyalty owed to its country, tribe, or employer? Was the Teldin using some kind of local slang which his translator was reproducing literally? He dare not answer until he was completely sure of the meaning of the question.

"I am sorry," he said. "Your question is unclear to me."

Before the Teldin could reply, Martin introduced himself and began describing his planet of origin. He spoke of Earth as it had been before the coming of the Federation, not the denuded and well-nigh depopulated planet that it had since become. Quickly he went on to talk about the lander and the much larger hypership in orbit above them and, when the Teldin expressed sudden concern, he assured the other that neither had anything to fear from the meteorites. He added that he, himself, did not carry such protection nor, for that matter, any other means of defense or offense.

When he finished speaking, the Teldin was silent for a moment. Then it said, "Thank you for this information which, in spite of being hearsay, could be of great importance. Does the being in the orbiting vessel own you?"

In his ear-piece he could hear Beth, who was monitoring the conversation, suppressing laughter.

"No," he said.

"Do you own it?"

"No," he said again.

"You only act that way sometimes," said Beth. *"But be alert. Another pedal vehicle is heading out of the city towards you. It is painted brown and bright yel-*

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low, towing an enclosed trailer and flying some kind of pennant, with two people on board pedalling fast. It should reach you in about twenty minutes.''

Martin bypassed the translator momentarily to say, ''The local constabulary, do you think? I can't react until they come into sight, when it would be natural to ask who and what they are. But our friend here worries me with its constant harping on ownership. And what does it mean by hearsay? I can't give it a straight answer until I know why it thinks the question is so important.''

He cut in the translator and went on to explain the relationship between Beth and himself. He was non-specific regarding the division of their work, but he had to go into considerable detail on human social anthropology, cultural mores, and reproduction. But suddenly the Teldin was holding up two of its four hands.

''Thank you once again for this interesting hearsay,'' it said slowly, as if it was uncertain that the true meaning of the words was getting through to Martin. ''You are answering questions which have not been asked, and not answering those which must be asked.''

The brown and yellow tricycle came into sight just then. Martin said quickly, ''The vehicle which approaches us at speed and flying a flag, and the beings propelling it. Is their mission important?''

The Teldin glanced at it in a manner suggesting impatience. ''It flies the pennant of the Master of Sea and Landborne Communications. Their mission has nothing to do with us and is of no importance compared with the visit of an off-planet being who avoids answering the most important question about itself . . .''

''*Just a couple of mailmen,*'' said Beth in a relieved voice.

''. . . Your status is not clear,'' it went on. ''Do you or your life-mate own the vessel which brought you here?''

My *status* . . . ! Martin thought. A little light was beginning to dawn. Aloud, he said, ''The vessels are not our personal property, but we are responsible for their operation.''

''But they are owned, presumably, by someone who directs you in their use?'' said the Teldin quickly, and added, ''You must obey this being's directions?''

''Yes,'' said Martin.

The Teldin made a loud, gurgling sound which did not translate, then it said, ''You are a slave, Martin. Highly placed, no doubt, considering the nature of the equipment you are allowed to use, but still a slave . . .''

Instinctively Martin stepped back as one of the being's enormous hands swung towards him. But it stopped a few inches from his chin with one digit pointing at the Federation symbol on his collar.

''. . . Is that the emblem of your Master?''

His first thought was to strenuously deny that he was any kind of slave, and his second was to wonder what new complication would be the result of that denial. But the Federation was, in real terms, his master, as it was the master of all of its non-citizens.

''Yes,'' he said again.

The Teldin turned its hand, which was still only a few inches from Mar-

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tin's face, to display a bracelet on its thick, furry wrist. The bracelet supported a flat oval of metal on which an intricate design had been worked in several colors.

"Like mine," said the Teldin, "your mark of ownership is small, tasteful, and inconspicuous as befits a slave in a position of trust and responsibility. But why did you ignore or evade the questions which would quickly have established your status?"

"I was unsure of your own status," Martin replied truthfully.

He remembered their tutor telling them again and again that in an alien-contact situation they must always tell the truth, although not necessarily all of it all at once. Measured doses of the truth gave rise to much fewer complications than well-meant, diplomatic lies.

"I don't like what I'm hearing," said Beth. *"The Federation does not approve of slavery or any form of—"*

"Now I understand," said the Teldin, before she could go on. "You thought I might be a Master and were being circumspect. Like the other passers-by, I thought you were a Master and could not, therefore, speak first. But contact between ourselves and an otherworld species would seem to be a project too important to be entrusted to a slave, regardless of its level of ability. My position forbids me saying anything which is directly critical of your Master, or any Master, but it seems to me that it would be more fitting if . . . if . . ."

"My Master did the work itself?" asked Martin.

"That was my thought exactly," said the Teldin.

Martin thought about their tutor and its enormous, sprawling body, and of the sheer size and complexity of any mobile life-support system capable of accommodating it, and he thought of that species' immense life-span. Carefully, and truthfully, he said, "My remarks should not be construed as critical or disloyal, but my Master is grossly overweight, very old, and has other projects demanding of its time and available energy."

"Since we are speaking face to face I can accept this information as factual until I have been instructed otherwise by my Master," the Teldin said, and the sudden change in its manner was unmistakable. It added, "But my Master will not accept anything you say."

"For this reason," Martin persisted, "I have been instructed to land on this world and gather information about your species and its culture so that my Master will know whom to approach with the initial offers of friendship and exchanges of knowledge."

"Your Master seems lacking in sensitivity and intelligence," said the Teldin, this time without any apology. "Your Master might just as well have sent a radio transmitting and receiving device."

"That has already been tried," said Martin, "without success."

"Naturally," said the Teldin.

The situation had gone sour, there could be no doubt about that. The impression given by the Teldin was that it belonged to an intensely status-conscious slave culture in which the Masters spoke only to other Masters or to God, and when a Master spoke to a slave the slave had to believe everything it was told and, presumably, disbelieve

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everything it had been told earlier by a lowlier being.

This is crazy, thought Martin. Aloud, he said, "What would have been your reaction if I'd been a Master?"

"Had you been a Master," the Teldin replied, "I would not have been able to give you any information until it had been vetted for content and accuracy by my own or another Master. Knowledge which is not passed down from a Master is, as you know, untrustworthy. The only assistance I could have given you would have been to arrange a meeting with another Master. Had you been a Master we could not have exchanged hearsay as freely as we have done."

"May this exchange continue?" asked Martin eagerly. "I have many questions. And answers."

"Yes, Martin," said the Teldin. "It may continue until I report your presence and everything that has transpired between us to my Master, who will assess the value of the material and instruct me accordingly.

"My curiosity is such that I am in no great hurry to make my report," the being added. "And my name is Skorta."

"Thank you, Skorta," said Martin, relieved. The atmosphere seemed friendly once more, but he still needed clarification on the Master-slave relationship. He said, "Will you make your report in person, and where?"

"*Careful . . .*" warned Beth.

"Thankfully, no," said Skorta. "I must make a hearsay report by radio. The device is in my Master's education complex in the city."

"Are you a *teacher?*"

Martin could hardly believe his luck. It would not matter which subject Skorta taught, because it was sure to have a grounding in many subjects. It was quite possible that this Teldin would be able to furnish them with all of the information necessary for the completion of their assignment, probably within a few hours.

"Properly speaking, only a Master can teach," it replied. "That is the law. I relay the approved information, suitably simplified for the age-groups concerned, to unruly little beings who only rarely think of questioning the validity of the information they receive. Even the words of a Master, as you know, may be doubted when they have been passed down through too many slaves."

"I should like to see your pupils," said Martin, "and other people in the city. Would I be able to meet a Master . . . ?"

Martin felt like biting off his tongue. Without thinking, he had blundered into that highly sensitive area again and he could almost feel the atmosphere congeal. The Teldin made a soft, untranslatable sound which might have been a sigh.

"Stranger," it said slowly, "your presence here is an insult and an affront to our Masters, since it is plain that your own Master thinks so little of this world and its people that it sent a slave to us as an emissary. To my knowledge there has never been a greater insult, and I cannot even guess at what the Masters' reaction will be.

"But I am willing to take you to the city," Skorta went on. "In fact, I am anxious to do so in order to prolong this contact with you and to discover as much about your people and their civilization as I possibly can before I am

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required officially to forget it. But I must warn you that the visit to the city could place you in grave personal danger."

"From the slaves or the Masters?" asked Martin. He was beginning to like this visually ferocious, four-armed nightmare which was glaring down at him. He could be certain of very little in the present situation, but he was sure that this being was honest and had a measure of concern for his safety.

"The slaves may restrain you if instructed to do so by the Masters," the Teldin replied slowly, "but only the Masters bear weapons and only they may kill. Now, if you will climb into my carrier, I shall transport you to the city."

"Don't go," said Beth, and gave reasons.

"I have received information," said Martin when she had finished talking, "that meteorite activity in this area will increase by a factor of three very shortly. I cannot be more specific because of ignorance regarding your units of time. According to the instruments on the orbiting vessel—"

"This is hearsay," Skorta broke in.

"True," said Martin quickly. "But the instruments are being read by my life-mate who is, naturally, anxious that no harm befalls me."

"I can understand why you attach importance to this information," said the Teldin, "but I cannot. It comes through a device to your life-mate, through another device to you and then to myself. There are too many possibilities for cumulative error between the fact and the reported fact for me to accept this information.

"Since you believe that the Scourge from the sky will be heavier soon," Skorta went on, "do you wish to return to the safety of your vessel now?"

In his other ear Beth was saying the same in much more forthright language, adding that there would be another time and another Teldin to talk to. But Martin wanted to go on talking to this one, and the intensity of the feeling surprised him.

"If I returned to my vessel," he said, choosing his words with care, "I could leave you a device which would enable us to continue our conversation. But this would be unsatisfactory for two reasons. I would not be able to visit your city, and you would consider any such conversation as untrustworthy hearsay. If, however, you can assure me from your own personal experience that this road is adequately protected, I would go with you to the city and continue to converse with you face to face."

The Teldin exhaled loudly and said, "Stranger, at last you are thinking like a Teldin." It began to pedal, and soon the protective wall was slipping past at a respectable rate of speed. Without taking its attention from the road, Skorta added, "I can also assure you that you may speak to me face to face even while addressing the back of my neck."

On only two occasions did the Teldin move briefly to the unprotected side of the road to let oncoming vehicles through on the inside. Right of way, it seemed, depended on the pennant flying on the approaching vehicle and on the size and position of the ownership badges worn by the occupants.

A flag and distinctively colored ve-

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hicle driven by a Teldin wearing a large emblem on a shoulder sash indicated that it was a slave of the lower order, a public utility worker or such. Badges worn on arm-bands signified a much higher grade of slave, and emblems worn at the wrist indicated a person high in the hierarchy of Teldin slavehood.

The road had detoured to utilize the natural shelter provided by a small hill when there was a sharp, crashing detonation followed by a diminishing, hissing roar. Martin's eyes jerked upward in time to see a large meteor trace an incandescent line across the sky below the cloud base, and he felt the shock of the impact transmitted through the solid, unsprung structure of the tricycle as it struck ground somewhere behind a nearby rise. Then suddenly the stony ground beyond the outer edge of the road was covered with tiny explosions of rock dust.

"This must be the heavier Scourge you spoke of," Skorta said. "The Masters warn us of such events, but even they cannot be precise in their predictions."

"Why do they refer to the meteorites as the Scourge?" said Beth. *"Do they equate all danger and pain with strokes from a Master's whip?"*

Martin waited until a large vehicle flying the pennant of what he now knew to be Master of Agriculture squeezed past on the outside, then asked the question.

"The Masters say," replied the Teldin, turning its head to look at him briefly, "that it is a continuing reminder that we cannot fully trust anything which is not experienced directly except, of course, the word of a Master."

He asked, "Are slaves, particularly high-ranking slaves like yourself, ever rewarded with your freedom?"

"We have freedom," replied the Teldin.

"But the Masters tell you what to do and think," Martin protested. "They alone have weapons. They alone administer punishment and have the power of life and death."

"Naturally; they are the Masters."

Martin knew that he was getting into a sensitive area, but he needed the answers. "Is the death penalty administered often? And which crimes merit it?"

"Sometimes the Masters execute each other for Masters' reasons," said the Teldin, slowing as the road curved sharply and entered a deep ravine. "With slaves it rarely happens, and only if there is destruction of valuable living property. For less serious crimes they may be reduced in status or forced to work in unprotected areas on the surface for a time, or if the offense is venial the peacekeeping slaves deal with it.

"An alert Master served by trusted and observant slaves," the Teldin added, "is able to stop trouble before it develops to the point where damage to property occurs."

For a few seconds Martin tried to control his revulsion at the picture of the Teldin culture which was emerging. If Skorta's Master received a full report of everything he had said to its slave then his next question was foolhardy indeed, but it had to be asked.

"Do you ever feel dissatisfied with your status, Skorta, and wish you were a Master?"

"Have you gone raving mad?" Beth

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began, and broke off because the Teldin was speaking.

"There have been times when I would have liked to be a Master," it said, and made another one of its untranslatable noises, "but good sense prevailed."

The floor of the ravine had taken an upward gradient and Skorta had no breath to spare for speech, so Beth was able to express herself at length.

"You are taking too many risks," she said angrily. *"My advice is to pull out as soon as you can. Some of the things you've said to Skorta could be construed as attempted subversion of a slave, and the Masters won't like that. Besides, with all the surface sensor material we are collecting still awaiting processing, plus your interview with Skorta, we should have enough information for our assessment. . . ."*

The picture which was emerging was clear but not at all pleasant, she continued. Teldi was essentially a slave culture, with the vast majority of the planetary population serving an elitist group of Masters who might be numbered in the thousands, or perhaps even hundreds. Their control of the slave population was such that the slaves themselves, with their minor gradations of responsibility and status, were as a group happy with the situation, although individuals like Skorta might occasionally have their doubts. So happy were they with their rôle that the slaves did not want to become Masters and helped maintain themselves in slavery by telling tales on fellow slaves who looked like causing trouble, while at the same time believing implicitly everything told to them by their Masters, even when this information contradicted first-hand knowledge. History was also vetted by the Masters so that the slaves had no way of knowing if there had ever been better times.

But the worst aspect of all was that the Masters held the power of life and death over their slaves and were the only people on all of Teldi allowed to bear weapons.

Beth went on, *"You know how the Federation feels about slavery or any other form of physical or psychological coercion in government. They will not be favorably impressed with this culture. But it's still possible that the slaves could qualify for citizenship if we could find a way of separating them from their Masters."*

"It isn't as simple as that," said Martin, instinctively lowering his voice even though the translator was switched off. "This fanatical distrust they display towards everyone and everything which is not experienced first-hand worries me. Trust between intelligent species is the most important requirement for Federation citizenship."

"That could change when the influence of the Masters is removed. But you agree that the slaves must have the opportunity of deciding for themselves whether to leave this place and join the Federation or remain with their Masters. Our assessment, remember, should include recommended solutions to the problem here."

"Let's ask one of them," said Martin. Through the translator he went on, "Skorta, would you like to live on a world free of the Scourge and where you could farm and build houses and travel on the surface without danger?"

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"Stranger . . . " began the Teldin, and was silent for nearly a minute before it went on, "It is senseless and painful to consider such possibilities. The Masters disapprove of mental bad habits of this kind. They say that the Scourge is, and must be accepted."

"Brain-washed!" said Beth disgustedly.

A few minutes later the ravine widened to become the head of a deep, fertile valley. Skorta pulled off the road and stopped to give Martin his first close look at a Teldin city.

The valley ran in a north-south direction and its heavily cultivated western slopes and bottomland were protected from the worst of the Scourge. Only when the meteorites slanted in from an angle of forty-five degrees or more, which they did very occasionally, was the city at risk. The city's structures hugged the ground and varied in size from tiny private dwellings with extensions underground to large buildings which spread themselves out rather than upwards. Regardless of size, every one of them had a thick, earth-banked west-facing wall, and what appeared to be important machinery and vehicles were housed inside deep slit trenches. Suddenly the Teldin pointed towards a high cliff further along the valley.

"That is my school," it said.

There was a flat apron of crushed rock around the base of the cliff and a wide, cavernous opening which was obviously a vehicle entrance. His magnifier showed about fifty smaller openings, regular in shape and plainly artificial features, covering the cliff face.

"I would like to see inside," said Martin.

The tricycle lurched across the verge and began picking up speed again.

"There aren't many children about," said Martin as the road took them into a residential area. "Are they at school? And the Masters, where do they live?"

Skorta overtook a structurally complex and highly geared vehicle powered by four furiously pedalling Teldins before it replied, "If the children are to attain adulthood they have much to learn from parents and teachers. And there are no Masters here. They live in the polar city, which is free from the worst of the Scourge, and only rarely do they visit our cities. We prefer it that way because the presence of a Master means grief for some and serious inconvenience for others. Believe me, stranger, while we are obliged to honor and obey our Masters, and we do, we much prefer them to leave us alone."

"Why?" asked Martin. The other's words had a distinctly rebellious sound to them.

"They come only in response to reports of serious trouble," the Teldin explained, breathing deeply between sentences because the road up to the school had steepened. "Not just to administer punishment but to extend or amend existing instructions regarding virtually everything. When a Master comes, the visit must not be wasted.

"It is a long, difficult, and dangerous journey for them," the Teldin concluded, "and their lives are much too valuable to be risked without very good reason."

Martin had heard of absentee landlords in Earth's history, but the concept of an absentee slave-master was difficult to grasp, as was the idea of a slave so-

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ciety which appeared to be self-policing and largely self-governing. He could not understand why they remained slaves, why they did not rebel and start thinking as well as doing for themselves, or why they held their Masters, whose absence was infinitely preferable to their presence, in such high regard.

The Masters, he thought, must be very potent individuals indeed. To complete the assessment he had to know more about them.

"Would the visit of a being from another world," he said carefully, "be considered important enough to warrant the attention of a Master?"

"Watch it . . . !" said Beth warningly.

"The visit of a slave from another world," the Teldin corrected—without, however, answering the question.

The tricycle rumbled across the stony apron at the base of the cliff and toward the vehicle entrance, and Martin saw that the tiny pupils of Skorta's eyes had opened to four or five times their normal size. The dilation mechanism had to be a voluntary one, because they were still several seconds away from the tunnel mouth. Plainly the Teldins had no trouble seeing in the dark. He adjusted his image enhancer.

Patches of luminous vegetation coated the tunnel walls, and at frequent intervals he could see short side tunnels opening into artificial caves containing machinery whose purpose was not clear to him. Skorta told him that important and irreplaceable machines were housed in these caves to protect them from the Scourge, and that metal was scarce on Teldi.

The Teldin guided its tricycle into one of the caves, and they dismounted.

"I realize that to a stranger like yourself this is hearsay," Skorta said, "but it is widely held to be a fact that this school is the most efficient teaching establishment on the whole planet. The Masters of Transport, Agriculture, Communications, Education, and associated Masterships send their slaves here, often from pre-puberty, and when they leave they are most valuable pieces of property indeed."

Martin hastily revised his estimate of the Teldin's status. It was closer to being a university lecturer than a schoolteacher, he thought, and asked, "What is your position in the establishment?"

"The position is largely administrative," Skorta replied as it led Martin into a narrow tunnel which climbed steeply. "I am the senior teaching slave in charge. We are going to my quarters . . ."

He made another revision, from lecturer to Dean of Studies.

" . . . Later, if you are agreeable," it went on, "I would like you to meet some of the students. But there is a serious risk involved—"

"The students are unruly?"

"No, stranger," the Teldin said, "the risk is mine in that the slave of another Master might report your presence before I did so. There is also the matter of your accommodation, should you wish to remain here for a time."

"Thank you, I would like to—" began Martin, when Beth's voice broke in.

"You can't just move in like a visiting lecturer. There are problems."

"There are problems," Skorta re-

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peated unknowingly, "regarding your life processes, particularly food intake and waste elimination. It is a unique problem for us. There is no knowledge nor even the wildest and most speculative hearsay regarding the possible effects of off-planet diseases on the Teldin species, or the effectiveness of our disinfectants on your wastes. This aspect of your visit has only just occurred to me. It is a serious matter which requires consultation with our senior medical slaves. So serious, in fact, that they will be duty-bound to refer the matter to the Master of Medicine."

The Teldin guided him along an ascending tunnel which led into a large cliff-face cave containing an enormous, high desk, chairs on the same scale, and walls covered by the luminous vegetation between gaps in the bookshelves. Martin had time to notice that the books were retained in place by heavy wooden bars padlocked at both ends.

Since the discussion about alien infections, Skorta had been keeping its distance while still asking an awful lot of questions. Plainly the danger of a possible off-world infection was evenly balanced by its curiosity. It was time he put the Teldin's mind at rest.

He said, "Your offer of accommodation is appreciated, but rather than cause discomfort to both of us I would prefer to spend some time every day in my own vessel. May I have permission to move it to the flat area in front of the school so that I can spend as much time here as possible?

"And the Master of Medicine has no cause for concern," he went on before the other could reply, "since off-world pathogens will not effect Teldins, nor will Teldin diseases be transmissible to the many hundreds of different species who inhabit the Galaxy. This is—"

"Hearsay!" the Teldin broke in.

"Naturally," Martin went on, "I have not visited all of these worlds, but I have lived for a time on three of them without contracting any other-species diseases."

He was bending the truth slightly, because one of the three was Teldi itself. The others had been Fomalhaut Three and the single lifeless planet which circled the Black Diamond at the galactic center.

"It is still hearsay, but I am greatly reassured," the Teldin said. "And your vessel will arouse less comment outside our school than in any other part of the city."

"Thank you," said Martin, and went on. "If a problem arises suddenly, as it may have done today had I been a potential disease-carrier, how do the Masters learn of it?"

The Teldin pointed to a recess which contained a table, chair, and shelves lined with what could only be Leyden cells. The batteries were wired in series to a collection of table-mounted radio equipment with which the legendary Marconi would have felt instantly at home. Skorta was giving him a rundown on the Teldin equivalent of the Morse code when Martin interrupted quietly.

"This is a mechanism. It transmits and receives information over a great distance, not face to face. Surely this is hearsay, and forbidden?"

The Teldin gestured towards the barred bookshelves and said, "That, too, is

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hearsay, but some of us are allowed to read it."

"You confuse me," said Martin.

"The volumes contain hearsay which is a transcription of much older hearsay," the Teldin explained, "selected by the Masters for study by only the highest-level slaves, slaves who are able to assimilate the material without mental suffering caused by disaffection with their present circumstances, or thoughts of what might have been had the Scourge not come upon us. Ignorance makes it easier to accept the inevitable."

"Are you saying," said Martin harshly, "that the majority of the slaves are kept in ignorance?"

"I'm saying that they are happier in their ignorance," Skorta replied. "This hearsay material is not kept from them entirely. But it must be earned, piece by piece, as a reward for mental and physical effort."

It was like some kind of freemasonry, Martin thought, with secrets of increasing importance being entrusted to the favored few who showed themselves able and willing to maintain the Teldin status quo. His sarcasm was probably lost in translation as he said, "And the Masters know everything?"

"Not everything," said the Teldin, showing more of its teeth. "As yet they don't know about you."

Once again Martin had the feeling that this particular Teldin was a potential rebel. He said, "I have the feeling that you do not want my presence reported to the Masters. Is this so?"

"That is correct," replied Skorta. "My reasons are, of course, selfish. Until official cognizance has been taken of your presence on Teldi, I am at liberty to learn as much as possible from you before the Masters rule on the factuality of your information. I expect that much of what I learn will have to be officially forgotten, not committed to writing, and will die with me. The Masters must consider the mental well-being of their slaves as the highest priority, and the simple fact of your presence here implies a way of life infinitely better than our existence on Teldi.

"Fortunately I can justify my delay in reporting you," it added, "because of initial confusion regarding your status and the necessity of educating you in our ways lest you inadvertently committed a crime, such as insulting a Master."

It was not lying, Martin thought admiringly, but it was certainly bending the truth into some fancy shapes.

"I had intended showing you the school now," Skorta went on, "but it would be better if I drove you back to your vessel so that you can bring it here."

"No problem," said Martin. "My vessel can be moved here without my presence on board."

"There is a problem," Beth contradicted. *"Not an urgent one, so you can let your friend show you its school. A cloud of denser meteorite material will arrive in about fifteen hours' time. According to the computer, the area for twenty miles around your city will be well and truly clobbered, so when I move the lander over there I suggest you excuse yourself politely and get the hell out."*

"The lander's force shield will protect—" began Martin.

"It will be a very heavy bombard-

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ment, and you will be safer on the hypership. There is something very odd about this Scourge, and the things the computer is telling me about it just don't make sense. I'd like to go over the data with you.''

Martin did not reply at once because he had followed the Teldin into a tunnel whose walls and ceiling were smooth and completely unlike the roughly chiseled rock surfaces he had encountered earlier. He could see small areas of tiling still adhering to the walls and many horizontal markings which were thin and pale green in color and which passed through small spots of dull red. He aimed the visual pick-up in his helmet at them and paused for a moment so that Beth would receive a clear picture, then hurried after the Teldin.

''Copper wiring and ferrous metal staples holding it in position,'' he reported excitedly. ''The insulation has rotted away and all that is left is the pale green and red corrosion traces. This is a much older section of the school, dating from a time when they had electrically generated rather than vegetation-produced lighting. That could have been hundreds of years ago.''

Beth sighed. *''So you intend staying there until the last possible moment?''*

''At least,'' said Martin.

They came to an opening whose sides bore red corrosion marks which suggested that it had once possessed a metal door. Inside there was a large, square room rendered small by the presence of more than thirty Teldins, who ranged in size from just over one meter to the full adult stature of three. The walls were hung with tapestries which were brightly colored, finely detailed, and dealt with various aspects of the Teldin anatomy.

His arrival caused an immediate cessation of work and a lot of untranslatable noises. He was introduced as an off-planet slave gathering information on Teldin teaching methods for its Master. Skorta told them to restrain their natural curiosity and resume work.

It was difficult to distinguish the teacher-in-charge from the adult pupils, Martin found, until he discovered that the more advanced students aided in the teaching process by instructing the less knowledgeable ones. He stopped beside two of the youngest, one of whom was immobilized and rendered speechless by practice splints and a tight mandible bandage, and asked how long it took for a fractured fore-arm to heal.

''Thirty-two days on average, Senior,'' the young Teldin said promptly, staring at the Federation symbol on Martin's collar. It went on, ''Longer if it is a multiple or compound fracture, or if it is sited at a joint or is complicated by severe wounding. If the accompanying wounds are improperly cleansed, putrefaction may take place and the affected limb must be removed.''

Martin estimated the age of the Teldin medical student to be the equivalent of a ten- or eleven-year-old of Earth. ''I thank you for this information,'' he said quickly, and added, ''How long will it be before you are a fully qualified medical slave?''

Everyone had stopped working again and were making untranslatable noises. Anxiously he went over his question for implied criticisms or hidden insults and could not find any. In an attempt to re-

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trieve the situation he said the first thing which came into his mind.

"I would like to answer some questions about myself and show you my vessel."

They were all staring at him in absolute silence. It was close on a minute before a young Teldin spoke.

"When, Senior?"

"I do not wish to interrupt your study or rest periods," he said. "Would early tomorrow morning be convenient?"

When they were in the corridor a few minutes later, Martin asked, "Did I say something wrong?"

Skorta made an untranslatable sound. "They would have observed your vessel at a distance, in any case. But now you have issued an invitation from your Master to view the machine closely and ask questions about it. The invitation extends, naturally, to the members of other classes. I trust, stranger, that your vessel is strongly built."

Martin was about to deny that his Master had issued the invitation through him, but then he realized that a mere slave like himself would never have been so presumptuous as to issue it without permission.

"You misunderstand me," he said. "I was asking if I'd said something wrong when I questioned the medical student about the time needed to qualify. On my world such students spend one-sixth of their lifetimes in study before they are allowed to practice medicine on other people. Some of them continue to study and discover new cures and teach for the rest of their lives."

"What a strange idea," the Teldin said, stopping outside the next classroom's entrance. "You are correct, Martin; I did not understand you. Your question to the student was a nonsense question. Badges of ownership are not worn in school since students are considered to be too ignorant to be good slaves, but the only medical student there was the teacher. The students will ultimately belong, if my memory serves me accurately, to the Masters of Agriculture, Communications, and Peacekeeping. Medical slaves are invariably teachers, and new medical knowledge must be sought only at the direction of the Master of Medicine.

"The incidence of injury and disease must be very small on your world," Skorta continued, "if students waste so much time studying medicine exclusively. On Teldi we study it as soon as we are able to read, write, and calculate. On Teldi death and injury are not rare. On Teldi everyone is a doctor."

They had completed the tour of the classrooms when the Teldin turned into the entrance to a long, high-ceilinged chamber whose far wall was more than two hundred meters distant. Against the wall Martin could see, dimly by the light of the ever-present luminous vegetation, a raised dais or altar with a cloth draped across it.

"This is the Hall of Honor," Skorta said, and began a slow march towards the opposite wall. "Here the slaves renew their promises of service and obedience to our Masters every day, or assemble for punishment or censure and, once a year, to graduate to higher levels."

It had not always been the slaves' Hall of Honor, Martin thought excitedly as he looked up to the great, curving

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ceiling and down to the regularly spaced tunnel mouths, where it arched down to meet the floor on both sides. He asked for and obtained Skorta's permission to use his helmet spotlight.

It showed lines and patterns of corrosion running along the floor and into the tunnels. The marks were wide and suggested heavy metal rail supports rather than wiring conduits. The walls and ceiling were also covered by strips and patches of corrosion, and as they walked towards the dais they passed shallow depressions in the floor which were filled with powdered rust. Martin's mouth was so dry that it was difficult to speak.

"This . . . this place is *old*," he said. "What was its purpose before it became the Hall of Honor?"

He already knew the answer.

"It is recorded only as hearsay," the Teldin replied. "But the hearsay is unapproved, forbidden as a matter for discussion by all levels of slaves. I know nothing other than that it was our first protection against the Scourge."

Suddenly Beth's voice was in his other ear. She sounded angry.

"It was probably one of the causes of the Scourge in the first place. That hall was once a storage and distribution facility which supplied missiles to less deeply buried launching silos. But you must have spotted that yourself. It certainly answers a lot of my questions."

"I spotted it," said Martin. "But causing the Scourge . . . I don't understand you."

"That's because you haven't been trying to make sense of the things the computer is saying about this ring system. . . !"

Normally such a system was formed as a result of a satellite (or satellites) approaching too closely to its primary and being pulled apart by gravitational stresses, and the debris being strewn along the plane of the moon's original orbit, she went on. Continuing collisions would eventually cause the pieces to grind themselves into uniformly small pieces. But at the present stage of the process many large pieces should have survived collisions with the small stuff, since the probability of the relatively few large chunks of the moon colliding with each other was small.

The debris orbiting Teldi contained no large pieces of debris.

"Then the ring has been forming for a long time," said Martin, "and the process is far advanced."

"No," said Beth firmly. *"The Scourge has been in existence for an extremely short time, astronomically speaking. The process began one thousand one hundred and seventeen Teldin years and thirty-three days ago, and was completed forty-seven years and one hundred and two days later."*

"Are . . . Are you *sure?*"

Beth laughed. *"For a moment I thought you were going to accuse me of using hearsay. The computer is sure and I'm sure, and you know which one of us is omniscient."*

"Are there any missiles left?" said Martin. "Any traces of radioactivity in a forgotten silo somewhere?"

"None," she replied firmly. *"The sensors would have detected it. They were all used."*

She resumed talking as the slow march towards the dais continued, but very often Martin's mind was leaping

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ahead of hers as piece after piece of the Teldin jigsaw puzzle fitted into place. The reason for the Scourge and the fatalistic acceptance of it was now plain, as was the cause of the pathological distrust of everything which was not experienced first-hand, the rigid stratification of the slaves, and the thinking done from the top which was so characteristic of the military mind. Finally there was the planet-wide catastrophe which had driven the surviving population to shelter in such installations as this, and brought about a situation which was in essence a military dictatorship. The Hall of Honor and one-time missile arsenal was certainly a key piece of the puzzle, but the picture was not complete.

"I must speak with a Master," said Martin.

"But there's no need!" Beth protested. *"Sensor probes have been dropped on this and other cities. We have more than enough data on the ordinary people of this frightful planet. They are resourceful, ethical, hard-working, long-suffering and, to my mind, wholly admirable. We should say so without delay. Our assessment can be based on an interview with one Teldin, remember, and we were not expected to take a long time about it. I say that the slave levels are in all respects suitable and should be offered Federation Citizenship following reorientation training to neutralize the conditioning of the Masters.*

"The slave-owners, from what we've learned of them, don't stand a snowball's chance. Our masters, the Federation, will not abide dictators who—"

"Wait," said Martin.

They had stopped before the dais which, now that he could see it clearly, consisted of a single cube of polished rock just under two meters on the side and with a large flag apparently covering the top and hanging down in front. The section of the flag visible to him was dark blue and bore the same design as that which appeared on Skorta's bracelet. The stone was too high for him to see the top surface, until he was suddenly grasped by four large hands above the knees and at the elbows and hoisted into the air.

And saw the symbol of ultimate authority.

Unlike the richly embroidered flag, the sword looked excessively plain and functional. Simply and beautifully proportioned, it measured nearly two meters long and had a broad, double-edged blade which came to a fine point. Its only decoration was a small, engraved plate set in the guard, which reproduced the design on the flag. Martin stared at it until the Teldin's four arms began to quiver with the strain of holding him aloft, then he gestured to be put down.

"It is the sword of the Master of Education," Skorta said slowly. "My Master died recently and a new one has yet to be chosen."

Martin was remembering the long, sharp blade of the weapon and the faint staining he had seen at its tip. He wet his lips and said, "Has it ever been . . . used?"

"The sword of a Master," it replied in a voice Martin could barely hear, "must draw blood at least once."

"Is it possible," Martin asked once again, "to speak with a Master?"

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"You are an off-world slave," the Teldin replied, accenting the last word.

It was the last word, in fact, because neither of them spoke during the long walk back to the base of the cliff where Beth had already moved the lander. Martin had a lot on his mind.

He had programmed the force shield to interdict inanimate objects and remain pervious to living beings. As a result, it was not the timer which awakened him, but the voices of more than two hundred young Teldins who were surrounding the lander. The cliff-face and city were still shrouded in pre-dawn darkness except for the intermittent illumination provided by the Scourge as it drew incandescent lines across the sky. He increased the intensity of the exterior lighting and went outside.

"I can't answer all of your questions at once," he said as his translator signalled overload, "So I will tell you about my vessel and some of the worlds it has visited. . . ."

Except for a few of the older ones who muttered "Hearsay" they became very quiet and attentive. He talked about planetary environments which were beautiful, terrifying, weird but always wonderful, and on the subject of the Federation he said only that it was a collection of people of many different shapes and sizes and degrees of intelligence who helped each other and who wanted to help Teldi.

When these youngsters grew up, Martin thought, it was likely that they would never be able to regard their Teldin way of life with complete acceptance. And if they were not judged suitable for Federation Citizenship and were left to fend for themselves, what a particularly lousy trick he was playing on them by talking like this.

"I can't predict where exactly they will hit," Beth broke in urgently, *"but that area is in for a bad time. Cut it short."*

"I'll answer a few questions, then send them to shelter," he told her. "The mountain on this side of the valley will protect us, so there's no immediate—"

The sky was lit by a sudden flare of bright orange and the ground seemed to twitch under Martin's feet. He broke off and looked around wildly, then up at the cliff. Everything seemed normal.

"That was a big one," said Beth, her voice rising in pitch. *"It hit close to the summit directly above you and started a rockslide. You can't see it past the shoulder of the cliff. Tell them to . . ."*

But Martin was already shouting for them to run for the shelter of the school. Nobody moved, and he had to explain quickly, so quickly that he was close to being incoherent, about Beth and the orbiting ship and its instruments which gave advance warning of the rockfall which they could not see. Still they did not move. They were dismissing his warning as hearsay. He angled one of the lander's lights upwards to show the top of the cliff and the first few rocks bouncing into sight over its edge.

They began to run then, too late.

"No, get back!" Martin shouted desperately. "There's safety here. Get back to the lander!"

Some of them hesitated. Without thinking about it Martin sprinted after the others and managed to get ahead of them—they were young and their legs were slightly shorter than his—and

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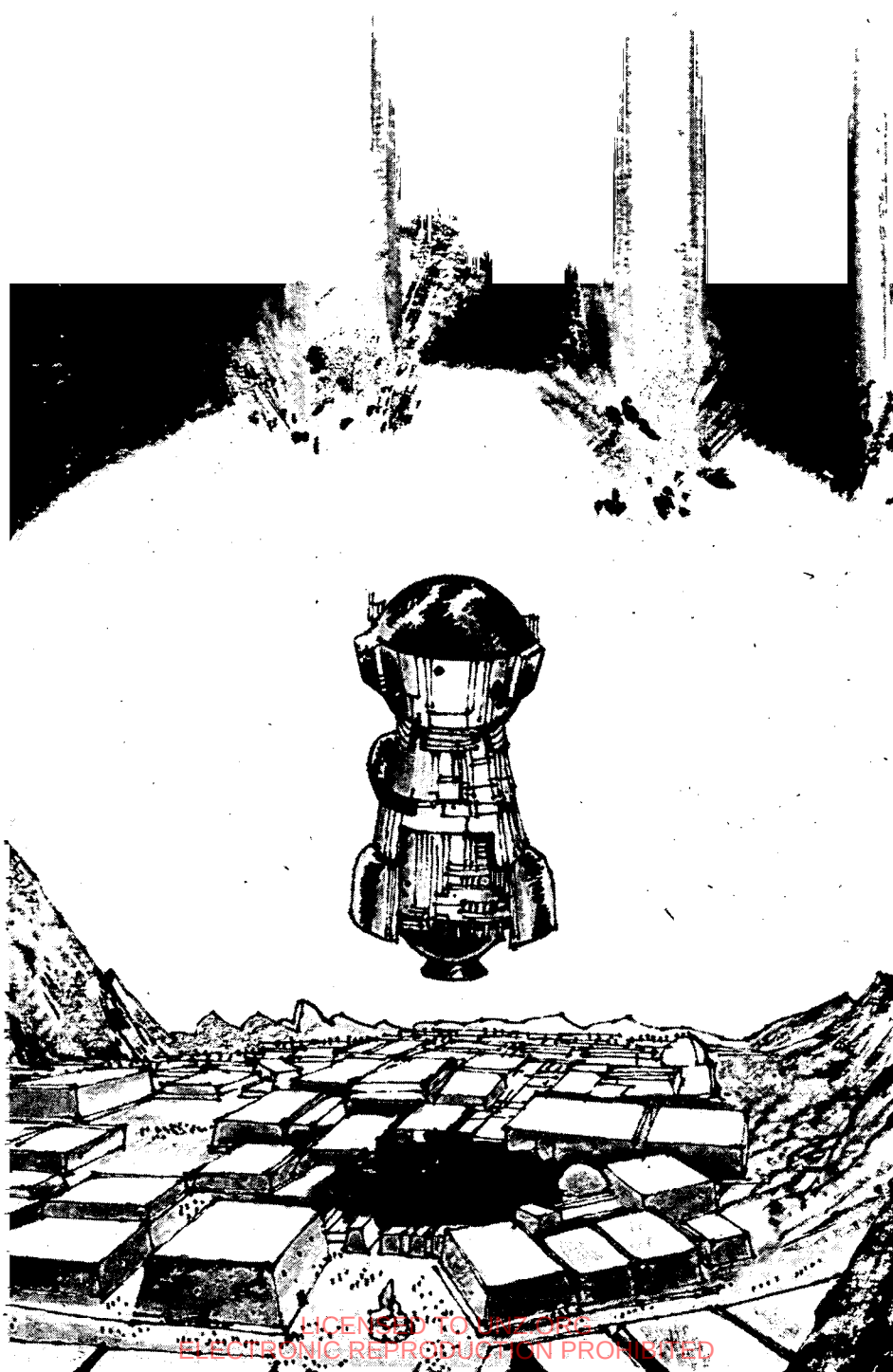

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wave them back. There were about twenty of them outside the protection of the lander's force shield now, but they were slowing down, stopping. He did not know whether they were simply frightened and confused or, since his recent demonstration of foreknowledge of the rockfall, they believed him when he said the area around the lander was safe.

The first rocks struck the ground between the lander and the school entrance, bounced outwards and rolled towards them. Three of the Teldins were knocked over and another was down hopping and crawling on four hands and one foot and dragging the injured limb behind it. Martin pointed at the glowing line on the ground which marked the outer edge of the force shield.

"Quickly, move them to the other side of that line. They'll be safe there, believe me!"

He grabbed one of the fallen Teldins by the feet and began dragging it towards the line. The rolling and bouncing rocks were being stopped by the invisible shield and the other students had realized that the protection was not hearsay. But more than half of them were down, and the others were trying to drag them to safety. Martin pulled his Teldin across the line and went after another.

"Get back, dammit!" Beth shouted. *"Half the bloody mountain is falling on you. . . !"*

A rain of fine stones and earth struck his back as he bent over the Teldin casualty, and suddenly a bouncing rock hit him in the back of the leg. He sat down abruptly, tears as well as dust blinding him. The rumbling sound from high upon the cliff was growing louder, and large rocks were thumping into the ground all around him with increasing frequency. The force shield and safety were only a few meters away, but he did not know in which direction.

He was grasped suddenly by four large hands which lifted him and hurled him backwards. He tumbled through the interface of the shield closely followed by the Teldin who had saved him. He blinked, trying to clear his vision as expert hands felt along his limbs and body.

"Nothing broken, stranger," said the young Teldin. "Some minor lacerations and bruising on the leg. You should use your own medication to treat the injury."

"Thank you," said Martin. He climbed to his feet and limped towards the lander.

The sound of the rockfall had become muffled because the hemisphere of the force shield was completely covered by loose rocks and soil. Several of the casualties lay looking up at the smooth dome of rubble which had inexplicably refused to fall on them, with expressions which were still unreadable to Martin, while the others had obviously accepted the invisible protection as a fact and were busying themselves with the injured.

When each and every victim and survivor was a trained medic, he thought admiringly, the aftermath of even a major disaster lost much of its horror.

Another young Teldin intercepted him at the lander's entry port. It said, "Thank you, stranger. All of the students who were trying to reach the school have returned or have been returned. There are no fatalities."

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Not yet, thought Martin.

He was thinking about the tremendous weight of rock pressing down on their force shield. That shield could handle the heaviest of meteorite showers without difficulty, but it had not been designed to support the weight of an avalanche. The drain on the small ship's power reserves did not bear thinking about.

He looked at the hemisphere of rocks above and around him, knowing that Beth's repeaters were showing her everything he saw, and asked, "How long can I keep it up?"

"Not long. But long enough for your air to run out first. There are two hundred people in there. I'm coming down!"

He started to protest, then realized that Beth knew as well as he did that she could not land the great, ungainly bulk of a hypership whose configuration suited it only for deep space and orbital maneuvering. The ship could in an emergency be brought close to the ground, but it was not the kind of maneuver to be undertaken by a trainee on first assignment. Worrying out loud to her would simply undermine her confidence, so he remained silent while he applied a dressing to his leg and watched the pictures she was sending to him.

He saw the valley city grow large in his main screen, saw the fresh meteor crater on the mountaintop above the school, and the grey scar left by the rockslide joining it with the great pile of rubble at the base of the cliff where the lander was buried. He saw four great, shallow depressions appear suddenly in unoccupied areas of the valley floor as the hyperships pressor beams were deployed to check the vessel's descent and hold her, braced and immobile, on four rigid, immaterial stilts. Her tremendous force shield covered the whole valley, and for the first time in over a thousand years the Scourge was impotent against the city.

A tractor beam speared out, came to a tight focus, and began to pull at the pile of rubble.

"Nice work," said Martin. "Concentrate on digging us out and clearing a path to the school entrance. Some of these casualties will have to be moved there for proper treatment, and quickly."

Clearing the rocks above the lander took much longer than expected, because every time Beth pulled out a mass of rubble, more slid down to fill the space. He decided to run a quick computation based on the volume of air trapped inside the shield and the rate at which it was being used by two hundred Teldins whose lung capacities were almost double that of a human being, and his anxiety gave way to mounting desperation.

He went outside to try to reassure the younger students, and discovered that three of them were the children of Masters.

Now I'm really in trouble, he thought.

All around him the older Teldins were suggesting to each other, and by inference to Martin, that they should not waste air in needless conversation. He returned to the lander.

"If you seal yourself inside the lander," said Beth suddenly, *"it has enough tanked air to keep you alive until I dig you out, while the same amount of air distributed among two hundred*

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Teldins wouldn't last ten minutes. Think about it.''

For several minutes he thought very seriously about it. He thought about facing Skorta with the news that he alone was alive among the two hundred asphyxiated students. Briefly, he thought about playing God and squeezing a few of the Teldins into the lander—young ones, of course, and probably the children of the Masters. What would Skorta think of that compromise? For some reason that particular Teldin's opinion of him had become very important to Martin.

Would it be better, he wondered in sudden self-disgust, simply to stay in the lander without speaking to any Teldin and, when he was able to take off, rejoin the hypership and return to Fomalhaut Three? He could tell the tutor that the problem set him had become too complicated, that the responsibility for assessing the Teldin species was too much for him. In short, he should simply walk away from the whole sorry mess.

He was still thinking about it, and he had not closed the lander's entry port, when Beth spoke again.

''All right,'' she said angrily. *''Be noble and self-sacrificing and . . . and stupid! But I have another idea. It's tricky. I don't think the equipment is supposed to be used in this way, and it could be more dangerous so far as you are concerned. . . .''*

Her idea was to concentrate on clearing a small area at the exact top center of the shield, the point where it could be opened without the rest of the shield collapsing, and use wide-focus pressors to keep the surrounding rocks from sliding into the opening for as long as possible—long enough, at least, for some of the stinking fog inside to be replaced with fresh outside air. The danger to Martin was that, if the pressors slipped, the rocks which fell into the opening would smash through the canopy of the lander's control position some thirty meters below, and Martin would no longer be worried about his assignment or anything else.

For the next twenty minutes he divided his attention between the rocks visible above him and Beth's outside viewpoint, which showed her doing things to that pile of rock with tractor and pressor beams which he had not thought possible. Then slowly, from above and below, a gap appeared. It was about two meters wide and it was holding.

''Now,'' said Beth.

Very carefully he opened the shield until the aperture was roughly a meter across. Stones and coarse gravel rattled down on the canopy, but nothing large enough to penetrate. The fine rock dust which had begun to fall was being blown out again as the hot, stale air rushed to escape. It held for one, two . . . five minutes.

''It's beginning to . . .'' Beth began.

He hit the stud which returned the shield to full coverage and cringed as several small rocks which had slipped through banged against the canopy. The gap above was again completely closed with rubble.

'' . . . slip,'' she ended.

Around the lander the uninjured students were on their feet, standing motionless and watching him in utter silence. Martin gestured vaguely, not knowing

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what else to do, and they began sitting down again.

The next time they needed to freshen the air, enough rubble had been cleared to allow Martin to leave the aperture open. But the sun was close to setting before the lander and the school entrance were completely uncovered and the students began moving in an orderly procession towards the entrance, carrying the injured with them. Skorta came hurrying in the opposite direction.

It stopped in front of Martin and looked down at him for several seconds. The Teldin was trembling, whether from anger, relief, or fatigue Martin could not say.

"The students," it said, "would have been safe inside the school."

"There were no deaths," Martin said, by way of an apology. "And, ah, three of the students are the children of Masters."

The Teldin was still shaking as it said, "Those students are the property of their Master parent. They are loved and cherished, as are all children, but they are not yet Masters and may never be." It gestured with three of its arms, indicating the lander, the valley city, and the hypership, which still looked gigantic, even though it had withdrawn to an altitude of three miles. "Your activities have been reported to the Masters. Now I have been instructed to proceed at once to the polar city to undergo a Masters' interrogation regarding you. If you wish it you may accompany me."

"I would like that," said Martin. "I could explain to the Masters why I—"

"No, stranger," the Teldin broke in, no longer shaking. "At most we can speak together and be overheard by the Masters, but nothing you say to me has value. To them it is hearsay and irresponsible. Martin, can you send . . . can you urgently request the presence of your Master?"

"No," said Martin, "my Master would not come."

"The Masters of Teldi will not accept your words," Skorta went on, "although I, personally, would like to speak with you at greater length. But there could be grave danger for you here. I have no previous knowledge or hearsay which enables me to foretell what will happen when we meet the Masters.

"It would be safer," he ended, "if you left at once."

"That is good advice," said Beth.

Martin knew that, but at the same time he was feeling confused by a sudden warmth of feeling for this large, incredibly ugly, and strangely considerate extra-terrestrial. There could be no doubt that the Masters were going to give it a difficult time, and that Martin was directly responsible for its problems. His presence during the interrogation would relieve the Teldin of a lot of the pressure—especially if Martin took the blame for everything that had happened. It would not be right to leave the senior teaching slave to face them alone. Besides, giving moral support to the Teldin might enable him to salvage something from this assignment.

"I want to meet the Masters," he said, to both the Teldin and Beth. "Thank you for your concern. However, I can remove the danger of the long journey to the polar city. My lander can take us there very quickly, and a

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speedy response to their summons might favorably impress your Masters. Are you willing to travel in my vessel?"

"Yes, Martin," the Teldin replied with no hesitation at all, "and I am grateful indeed for this unique opportunity."

There was a feeling in Martin's stomach not unlike negative G, a sensation composed of fear and excitement at the knowledge that, within a matter of hours, the empty spaces in the Teldin jigsaw puzzle would be filled in and he would know the full extent of the trouble he had caused and, perhaps, have paid the penalty for causing it.

Initially they flew only as far as the hypership, because the lander needed a systems check and power recharge after its argument with the avalanche. The Teldin was folded so awkwardly into the space available in the control cubicle that it could not see out and, much to its disappointment, the lander's dock on the mother ship had no viewports even though there was enough headroom for it to stand erect.

When it met Beth, Skorta made a bow which could only be described as courtly. It told her that it had had a life-mate who had perished by the Scourge many years ago and had not met another who had engaged its intellect and its emotions to anything like the same extent, but that the fault was probably its own, because several of the teaching slaves had made overtures.

Martin left them talking while he went to the computer's Fabrications module. He did not intend going down to meet the Masters either empty-handed or with an empty backpack.

Beth joined him as he was listing and describing his requirements to the Fabricator.

"I like your friend," she said, leaning over his shoulder. "Right now it's in the observation blister and looks as if it will stay there for a long time. You know, I still don't agree with what you intend doing, but I can understand why you don't want to let it face the Masters alone . . . *No!* You can't take *that!*"

She was pointing at the image on the Fabricator's drafting screen, and before he could respond she went on vehemently, "You are not allowed to carry weapons. The Federation forbids it in a first-contact situation, and your only hope of surviving this meeting may be to go in unarmed as a demonstration that your intentions are good even though you've stirred up a hornets' nest. Going down there is stupid, anyway!"

Her face was without color, and it was plain that she was desperately afraid that she might never see Martin alive again if he went down there among the Masters. She wanted him to forget all about it, to return with the assignment incomplete and to stay alive, but she knew that he would not do that.

Reassuringly, he said, "I don't expect to use the weapon on anyone. And I'm beginning to understand the setup here at last. I'll be all right; you'll see . . ."

Because of the emotional involvement, it was more than two hours before she was properly reassured and fully satisfied in all respects, and Martin was able to collect the Teldin from the observation blister.

He found that the teaching slave had not moved, seemingly, from the position in which Beth had placed it. Re-

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membering the high acuity and light sensitivity of Teldin eyes, Martin could understand why. Not only could it see surface features on the planet below which Martin would have required high magnification to resolve, but from the now-orbiting hypership the number of stars it could see even in this sparsely populated region of the Galaxy must have paralyzed it with wonder. He had to tell Skorta three times that the lander was ready to leave before it responded.

"Having looked upon all this splendor," it said, and its four arms rose and its head bowed in a gesture which was like an act of worship, "how can I go on living as a slave?"

Martin was not surprised to find that the polar city was bitingly cold, that the level of technology apparent was much higher than that of the valley city they had recently left, and that Skorta, who had been born here, directed the lander to within a few meters of the entrance to the Hall of the Masters. What did surprise him was that the Hall was ablaze with artificial light.

"A courtesy extended to a highly placed slave of a strange Master," said the Teldin. "A slave with imperfect vision. It means nothing more."

The Hall itself was surprisingly small. He thought that the debating chamber of the legendary Camelot might have looked a little like this, except that the Teldin table was horseshoe-shaped rather than round, and partially bridging the open end was a small, square table and a chair. At a slow, measured pace Skorta led him towards them and, when they arrived, it motioned him to stand at one side of chair while it stood on the other side.

"You are in the presence of the Masters of Teldi," it announced, and bowed its head briefly. Martin did the same.

There were several unoccupied spaces around the horseshoe. Before every Master's chair, whether it was occupied or not, the richly embroidered flags were spread so that their emblems hung down from the inside edge of the table. Lying on the flags were the swords of the Masters there present. All of the Masters were adult, some of them looked very old and, so far as Martin could see, they showed no physical signs of the self-indulgence and excesses of beings with ultimate authority over a planet's entire population. And these omniscient, all-powerful rulers of Teldi numbered only seventeen.

He stood silently as the teaching slave was questioned regarding Martin's arrival and his subsequent words and actions by a Teldin whose flag bore the emblem of the Master of Sea and Landborne Communications. He thought that the Master of Education would have been more appropriate until he remembered that that Mastership was vacant and its authority shared by two other Masters on a caretaker basis. This particular Master was about to experience a lesson in communication that it would not soon forget.

They continued to ignore Martin's presence while the teacher described the rockslide and the strange vessel's protective device which had saved the students from certain death.

It's trying to make a hero of me, Martin thought gratefully. But the interrogator was not impressed.

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The Master wanted to know where the students would normally have been had the invitation not been issued. It added, obviously for Martin's benefit, that Skorta was no doubt aware that a slave was the property and sole responsibility of its Master and any wrongdoing on its part should result in the punishment of that Master.

Martin smiled at the thought of these seventeen sword-carrying absolute rulers of Teldi trying to punish the Federation for negligence in his training. But the smile faded when he thought of the Federation's reaction to the news that Teldi held it culpable for his misbehavior.

At times like this, he thought wryly, there was a lot to be said for the life of a happy and obedient slave.

The teacher was concluding its report. It said, "On being told of my instructions to report to the Hall of the Masters as quickly as possible, the stranger offered to take me in its ship. On the way we visited the larger vessel, which had been responsible for shielding the entire city from the Scourge while it was freeing the trapped students. There I spoke to the stranger's life-mate and looked down on Teldi, on all of Teldi, and at the stars."

"That experience," the interrogator said quietly, "we envy you. Do you feel friendship for this stranger?"

"I believe that we feel friendship for each other, Master," Skorta replied.

"Is this the reason why it accompanied you," said the Master, "when you must have explained to it that the safer course would have been to leave this world and its Masters, whom it so grievously insulted?"

"It is," Skorta answered. "The stranger also wished to deliver a message to you from its Masters and would not be dissuaded."

The Master made another untranslatable sound and said, "A staunch friend, perhaps, but undeniably a most presumptuous slave. Why is its Master not present?"

Quickly the teaching slave explained that the stranger's Master was of a different species which breathed an atmosphere noxious to Teldins, and could not speak face to face to any person not of its own species. Skorta ended, "This is the reason the stranger was instructed to land on Teldi as an intermediary."

The interrogator recoiled, as if it had just heard a very dirty word, then went on, "Intermediaries are not to be trusted, ever. Their words are hearsay, untrustworthy, irresponsible, and cause misunderstanding and distress. Only a Master can be believed without doubt or question; that is the Prime Law."

Martin could remain silent no longer. "There were good reasons for the mistrust of hearsay, one thousand one hundred and seventeen of your years ago. But now the Prime Law has become a ritual and a means of enforcing—"

"You stupid, irresponsible slave!" Skorta broke in, shaking with what could only be anger. "Stranger, you insult the Masters as your own Master has already done by thrusting hearsay at them. Be warned. You may not speak to a Master, but if you must speak to clarify some portion of my report you will do so only to me and with the Master's permission."

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"No insult was intended," said Martin.

"An insult can be given without intent," the teacher replied more calmly, "because a slave, being a slave, does not properly consider all the possible results of its words or actions."

Martin let his breath out slowly. To Skorta he said, "There are mechanisms on the larger ship which are capable of observing and measuring the movements of the individual pieces of rock and dust which make up the Scourge. I do not know the original reason for your Scourge, but these mechanisms tell me how and when it began, and from this information I have deduced—"

"Silence," said the Master quietly. It did not look at Martin as it went on, "We have no wish to listen to a slave's deductions from hearsay evidence. I have a mind to discuss with you, teacher, matters which will instruct this stranger with complete accuracy . . ." It paused and, grasping the hilt of its sword, looked all around the table. " . . . regarding the Scourge. Since this will involve discussion of the Ultimate Hearsay you, as a slave, may refuse."

The teacher replied slowly, as if performing a spoken ritual. It said, "No slave may know the Ultimate Hearsay. No slave, be it Teldin or other, may instruct a Master. The strange slave may not speak except to me, therefore I shall remain. I do this willingly, and henceforth I accept full responsibility for the results of my words and actions before the other Masters."

Martin almost lost the last few words, because suddenly everyone in the Hall was standing up and reaching for their swords. He wondered sickly whether his Earth-human legs could get him to the entrance before the longer Teldin limbs—including the ones swinging swords—could head him off. His own weapon was still in the backpack, and pitifully inadequate anyway. But the interrogator had swung around and was holding up all four hands palm outwards.

"Hold!" it said. "This matter will be dealt with in proper form when its Symbol has been brought to us. First must come the judgment and ruling on the off-world slave."

"What's going on?" said Beth anxiously. *"You said you knew what you were doing and now. . . . Look, I'm coming down."*

"Wait," said Martin, switching out the translator. "The Masters can talk and listen to me through Skorta, and they will tell it things for my benefit which slaves are forbidden to know, because it is curious about me and so are they. The punishment for learning this forbidden knowledge must be severe, yet Skorta seems unafraid. There's something very odd going on here, and I'm beginning to wonder if . . ."

Martin broke off because the interrogator was talking again. In calm, emotionless tones it was fleshing it out, adding depth and a human, or at least Teldin, dimension to the catastrophe which had smashed their technologically advanced culture flat and returned its people to their equivalent of the dark ages.

Up until one thousand one hundred and seventeen years ago Teldi had had a satellite, an airless body rich in the mineral resources which had become so

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depleted on the mother world. The moon had been colonized many centuries earlier and, because it had been given the best that the mother planet could give in the form of its keenest young minds and technical resources, the colony became more technologically advanced than its parent. Its people remade their lifeless world, scattering its surface with domed cities and farms and burrowing deeply towards the still-hot core. They became self-sufficient, justifiably proud and independent, and finally an armed threat.

But it was not a nuclear attack which destroyed Teldi's moon, the Master insisted. It had been a catastrophe deep inside the moon, associated with experiments on a new power source, which had detonated the satellite like a gigantic bomb.

On Teldi they watched their moon fly slowly apart, and they knew that if one of the larger pieces were to crash into their planet it would tear through the crust into the underlying core stuff—and in the resulting planetary upheaval all life on Teldi would be wiped out. However, they had maintained in a state of instant readiness a tremendous arsenal of nuclear weapons capable of reaching their newly disintegrated moon, and large numbers of these were hastily reprogrammed to intercept the larger masses of lunar material heading toward them and to blast them into smaller and much less devastating pieces.

Many of these relatively small pieces fell on Teldi, and in the resulting devastation more than a quarter of the planetary population lost their lives, but the threat had been neutralized—for the time being. Computations made on the paths of the remaining large pieces of the satellite clearly indicated that the mother world was still in danger. There was a very high probability that world-wrecking collisions would take place on an average of three times every century. The planet's long-term survival depended on the Teldins' reducing the size of these future world-wreckers in the same way as they had dealt with the first ones.

In spite of the highest priority given to missile production and the development of more effective warheads, and to the manned missions which visited the larger bodies to plant charges designed to blow them virtually to dust, progress was desperately slow. Large meteors continued to fall which all too often demolished key missile production or launching installations.

For this reason it required close on fifty years for the project to reach completion—in that there were no longer any bodies in Teldi's path capable of destroying the planet, and no missiles left to send against them if there had. Their moon had been reduced and scattered into a nearly homogenous cloud of meteorite material, most of which circled the planet or fell steadily onto its surface.

The Scourge had come.

No fabrication or person could live on or above the surface of Teldi for more than a few dozen revolutions without the certainty of damage, injury, or death. The remnants of the technology which had survived long enough to save them was eroded away or hammered flat by the Scourge. Their once-great civilization was reduced to ruins, its population decimated and driven slowly

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back towards the level of their savage, cave-dwelling pre-history—but not all the way back.

They had been able to survive in their caves, mines, and underground missile installations and extend them into subsurface cities. They had farmed because the Scourge could not kill every plant and tree, and they had built protected road systems and kept as much as was useful of the old knowledge alive and stored the rest. But the chief reason for their continued survival as a culture had been that increasing numbers of the frightened and despairing population placed themselves under the protection and orders of the Military Masters.

It was in the nature of things that saviors became masters, and it had been all too easy for the system to perpetuate itself when the Masters had the respect as well as the obedience of their slaves, as well as a large measure of control over their thinking—including the habit of distrust, which was instilled from birth.

For there had been a few moments' warning of the destruction of their satellite, time enough for the mother world to be told it was about to be obliterated because someone had been too stupidly trusting—someone had accepted as fact something which should have been doubted and rechecked—and for this error Teldi had been lashed by the Scourge for more than a thousand years. And the reason for their fanatical distrust, Martin thought, as the Master ended its history lesson, was now all too obvious.

If only the Masters had not enslaved the population while they were doing it, and made knowledge available only to a favored, high-ranking few. . . .

"In every society there must be persons with authority and responsibility in charge," Skorta said suddenly, making Martin realize that he had been so affected by the Master's history lesson that he had been thinking aloud. "No mechanism should be overloaded by a responsible owner. But you have been to my school, Martin, and you know that in practice every person is given a little more knowledge than it needs, in the hope that it will evince a desire for more. Naturally, it is not given more until it has shown that it is capable of using responsibly the knowledge it already possesses."

"I begin to understand," said Martin. "The instructions of my Master were that I—"

"Please inform this slave," the interrogator broke in, "that the instructions of its absent Master mean nothing to us. There are three instances of recorded hearsay describing the landing on Teldi of mechanisms which spoke our language and tried to show us great wonders projected into the empty air around them before they were destroyed. Our reply was that we would accept no communication unless it was delivered to us in person by a responsible Master. This slave is not a responsible person, its presence before us is an insult, and I cannot understand its Master's purpose in sending it here when that Master is fully aware of the situation."

"We are not yet decided what to do with this slave," the Master went on. "Should it be punished physically as a child is for persistent disobedience, or

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merely returned to its Master who will not act like a Master?"

Martin swallowed, thinking that a spanking from one of the overlarge Teldins would not be a pleasant experience either physically or mentally. He was also thinking about the tutor on Fomalhaut Three, who was most certainly aware of the problem, and Martin had been given full responsibility for its solution. He could run away or try to solve the problem—the decision was his alone. He swore under his breath. He was beginning to view the tutor, the Teldin Masters, and even himself in a new light.

"Before this decision is made," he said to the teacher, "is it permitted that I discuss with you, my friend and equal, my instructions regarding—"

"Martin," said the Teldin, "I am no longer your equal."

His first feeling was one of betrayal. He wondered if Skorta had been as honest with him as it had seemed. But then he remembered some of the things it had said on the way to the city, in the school, and on board the hypership. Skorta had come across as an intelligent, liberal-minded, responsible, and perhaps potentially rebellious slave who did not mind talking a little hearsay or thinking for itself. To him, it had appeared to be a truly civilized and cultured being who was fighting its slavehood and beginning to win.

And now, Martin saw with a sudden flood of understanding, the fight was over.

"Your bio-telltales are going mad!" said Beth, sounding both angry and frightened. *"Pulse-rate and blood pressure are 'way up and your . . . Dammit, are you getting ready to do something stupid?"*

There was no need to answer her, because she would see and hear everything. He moistened his lips and for the first time he turned to address the assembled Masters of Teldi directly.

"I have considered this matter fully and the possible consequences of making my decision," he said, "and I wish to be once again the equal of my friend."

For several interminable seconds there was neither sound nor motion in the hall. Then the teacher walked slowly to an empty place at the horseshoe table and turned to face him, leaving Martin alone beside the Table of Interrogation. All sound and motion ceased again, and even Beth seemed to be holding her breath. He thought of asking permission for what he was about to do, then decided against it.

Asking permission was for slaves.

He removed and opened his backpack and spread the Federation flag across the table so that the silver and black emblem hung over the outer edge in plain sight of the Masters. Then he withdrew the weapon, the scaled-down replica of the Master of Education's sword he had seen at the school, and which had also been fabricated on the hypership, and laid it on top of the flag. The hilt, which also bore the Federation symbol, lay towards him. Then he folded his arms.

The Masters arose and seventeen hands went to the hilts of their swords. But this time the Master of Sea and Landborne Communications did not call a halt, as it had done in the case of Skorta, the one-time teaching slave,

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because the interrogator was grasping its sword, too. Martin swallowed as seventeen swords were raised to Teldin shoulder height and held at full extension with their seventeen points directed unswervingly at his face.

"Will the new Master-Elect of Education," said the interrogator, "please join the off-world would-be Master and guide it in the traditional acts and response."

Now I'm committed, thought Martin, but to what? The interrogator was speaking again.

"Do you accept sole and undivided responsibility for your words and actions, and omissions of words or actions, and the results thereof? Do you accept such responsibility for your property, whether animate or inanimate, its efficient working, its proper maintenance, training, feeding, and conduct towards the property of other Masters? Do you accept as your own responsibility the results of the conduct or misconduct of all such property, and will you reward, correct, or chastise the property committing such acts? Will you strive always to increase the efficiency, well-being, and intelligence of all your animate property in the hope that they will one day become capable of accepting the ultimate responsibility of a Master? As the bearer of ultimate responsibility, do you agree to defend with your life your person, property, and decisions and if, in the judgment of your fellow Masters, your actions and decisions threaten harm in large measure to your own or the property of others, that you will forfeit your life?"

Martin felt perspiration trickling from his armpits and he knew that if his arms had not been folded tightly across his chest, his hands would have been trembling.

"Consider carefully, offworld friend," said the new Master-Elect, who was again standing beside him. "An impulsive decision does not impress them, even though the impulse was of friendship and loyalty. If you withdraw now your punishment will probably be a token one, possibly banishment from Teldi society and removal of Masters' protection, neither of which will inconvenience you greatly."

Martin cleared his throat. He said, "The decision was carefully considered and is not based solely on sentiment. I am not stupid, but I have been confused by your Master-slave relationship on Teldi, and by the true nature and function of the Masters. I am confused no longer."

The swords were still pointing at him, so steadily that he could almost imagine that the scene was a still photograph, when Skorta spoke again.

"Raise your sword and hold it vertically with the base of the hilt resting upon your flag," it said. "Support the sword in the vertical position by pressing the palm of your hand against the tip. You will exert sufficient pressure for the tip to draw blood. You will then speak the words 'I accept the duties and responsibilities of a Master,' after which you will replace the sword and self-administer the appropriate medication to the wounded hand and await the response of the Masters."

He nearly fumbled it, because the height of the Table of Interrogation made it necessary for him to stand on tiptoe to press downwards against the

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point of the sword, so that the tip slipped from his palm and jabbed into the fleshy pad at the base of his thumb. But he was so relieved that the sword did not go skidding onto the floor that he scarcely felt the pain, even when the blood trickled slowly down the blade.

As steadily as he could, Martin said, "I accept the duties and responsibilities of a Master."

The swords were still pointing at him while he replaced his on the flag and slapped an adhesive dressing onto his hand. Then one of the swords swept upwards to point at the ceiling. Another followed suit, then another and another until all were raised, then all seventeen swords were lowered and replaced on their Masters' flags.

Skorta bowed gravely and said, "The election was unanimous, offworld Master. You may speak to us now, and everything you say will be accepted as factual if you say that it is, and any demonstrations by mechanisms operated by you will be given similar credence. If your words or actions prove false or inaccurate you will, of course, be answerable to your fellow Masters."

"I understand," said Martin, as he removed the tri-di projector from his pack. "What if the vote had not been unanimous? Would I have had to fight?"

"Only as a last resort," the Teldin replied, "and after many days debating other and non-violent solutions. There are never enough Masters on Teldi, Martin. The senior slaves who become eligible for Mastership and are encouraged to apply are far too intelligent to want the heavy responsibility involved. But there are an occasional few who, like ourselves, are overtaken by a strange irrationality which makes us find rewards in performing thankless tasks and . . . You are ready to begin?"

"I am ready," said Martin.

He waited until Skorta had returned to its place at the big table, then announced that he would describe and depict the events which had occurred on his own home planet, Earth, when it had been contacted by the Galactic Federation and its people offered Citizenship. Indicating the entrance and wall facing the big table, he started the projector. He heard the Masters making untranslatable noises as, in spite of the hall lighting, there appeared a volume of blackness of apparently endless depth.

The show began. . . .

Earth had been contacted because within a few centuries it would perish of starvation, war, and disease.

He showed the arrival of the Federation transporters in Earth orbit, a ring of gigantic matter transmitters which arched across the night sky like an enormous jewelled necklace, and some of the great, white cubical buildings which appeared overnight close to every town and city. These were the Galactic Federation Examination and Induction Centers, and into them went the people of Earth to be rejected as Undesirable, or accepted as Citizens, or classified as non-Citizens requiring further examination and training.

"But you're telling them everything!" Beth's voice sounded anxiously in his ear-piece. *"Our tutor might not want that. Or don't you care anymore?"*

"I care," said Martin. "But I'm not sure what our tutor expects of me. If it had wanted me to do or not do some-

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thing it should have been more specific, instead of simply telling me that the Teldi situation was my responsibility. And I do care about these people, too much to be dishonest with them."

"This Master business," said Beth quietly, *"you're taking it very seriously."*

"Yes," he said, then added quickly, "No more talking, the next bit could be tricky. . . ."

The people of Earth, like every other planetary population offered citizenship, had been screened and divided into three categories, the Citizens, the non-Citizens, and the Undesirables. The majority of applicants were successful and became Citizens, to move to the Federation World to begin a life in which their potentialities could be fully realized free of personal, political, and economic pressures. In the Federation citizens were not forced to do anything, because the type of people who would use such force were excluded as Undesirables.

Beings who sought power for its own sake remained on their home worlds as wolves who no longer had sheep on which to prey, and Martin emphasized the fact that on the new world the leaders were shepherds. But the Masters were becoming restive at the idea that they might be considered undesirable.

He went on quickly, "Unlike the Citizens, the non-Citizens obey orders and have to submit to training. Even though they comprise many different species with great variation in intelligence and ability, they are vital to the functioning of the Galactic Federation, and they have the option of becoming Citizens in time. They are—"

"Slaves," said one of the Masters.

"Why must these beings leave their home planets to become Citizens?" asked another before Martin could reply to the first. "And are these new worlds suited to their needs?"

What is a slave, wondered Martin. Aloud, he said, "There is only one world. Observe!"

In the projection the sky blazed with stars—singly, in clusters, and in great, swirling eddies—and so dense was the starfield that it was difficult to find even a tiny area which was dark. Except, that was, for one area in the center, where there hung an enormous, black, and featureless shape, the shape reproduced on the Federation emblem.

"This," said Martin, trying to hold his voice steady, "is the Federation World."

It was a hollow body, he explained as simply as he could, made from material which had comprised the planets of this and many other solar systems, and it contained the intelligent beings of over two hundred different species who were presently members of the Federation. This superworld enclosed the system's sun and used its output for light, heat, and as a power source for its soil synthesizers. The interior surface area was vast beyond imagining. The projected future populations of all the intelligent species in the Galaxy would never overcrowd this world.

As the diagrams and sharply detailed pictures flashed into view, Martin tried to describe the awful immensity of the Federation World, its topography and environmental variations, its incredibly advanced technology. But one of the Masters was waving for attention.

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"Since the Scourge returned us to the dark ages, Teldi has nothing to offer," it said. "Yet you are considering us for citizenship of this . . this . . . *Why*, stranger?"

Martin was silent, remembering his own reaction on first seeing the Federation World. The Masters had had enough superscience and frontal assaults on the feelings of superiority for one day. He softened his tone.

"The Federation accepts all levels of technical and cultural development," he said. "Its purpose is to seek out the intelligent races of the Galaxy and bring them to a place of safety before they perish in their own effluvia or some other natural or unnatural catastrophe befalls them. On this world they will grow in knowledge and intermingle and, in the fullness of time, the combined intelligence of this future Federation will be capable of achievements unimaginable even to the most advanced minds among its present-day Citizens. It will be a slow, natural process, however, free of any kind of force or coercion. And while the Citizens are climbing to the scientific, philosophical, and cultural heights, they must be protected."

He cancelled the projection, and for a long time nothing was said. They were all staring at his flag, at the black diamond on a silver field which was the Federation emblem, but still seeing the tremendous reality which it represented. Perhaps he had shown them too much too soon, and had succeeded only in giving them an inferiority complex from which they would never recover. But these were the top people on Teldi and they had earned their positions by rising through the ranks. They were tough, honest, and adaptable, and Martin thought they could take it.

It was the interrogator who found its voice first. "You came here to judge us on our suitability or otherwise for citizenship of this . . . this Galactic Federation. We may not wish to join, stranger, but we would be interested in hearing your verdict."

To tough, honest, and adaptable, add proud and independent. Now he knew what he had to do.

Before he could reply, the Master-Elect of Education walked slowly to his side. It was staring down at the Federation flag and not at Martin as it said, "Martin, this is important. If your pronouncement is open to discussion and subsequent modification, touch the hilt of your sword as you speak. If it is your own unalterable decision which you will defend, if necessary, with your life, you will grasp the hilt firmly and hold the weapon in a defensive position."

"They're still in a state of shock," said Beth in the angry, despairing tone of one who knows that good advice is being ignored, *"And there are no guards on the door. Run!"*

"No," said Martin stubbornly. Through the translator he went on, "Before I deliver my judgment I must first draw analogies with the systems which govern Teldi and the Federation.

"Undesirables, trouble-makers, the power-seekers are rendered impotent and ignored," he went on. "The Citizens are free and protected, and the non-Citizens do the hard but interesting work associated with the maintenance of the World's systems and on-going projects. This work is not forced on them, and the reason they do it is two-fold. They

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feel a self-imposed responsibility in the matter and they, regardless of their species or level of intelligence or competence, belong to that group of restless and adventurous entities who are not sure that the protected life of a Citizen is for them. They are the errand boys, the servants, the slaves of the Federation, save only in the area of responsibility."

Around the horseshoe table hands were twitching restively towards their swords, but Martin did not touch the hilt of his own. Not yet.

"On Teldi," he went on, "the system of government and the general display of mistrust were initially abhorrent to me, as was the tight mental control which apparently was being imposed by the Masters. But the reason for the mistrust and the insistence that hearsay be vouched for by a highly responsible person, a Master, became plain when I learned of the original cause of the Scourge. Regarding the control of imparted knowledge, I learned that much of the forbidden hearsay was available to low-level slaves trying for higher positions. But few feel impelled to accept the ultimate responsibility. There are never enough Masters on Teldi.

"I also discovered," Martin continued, still keeping his hand well away from the sword, "that the slaves of Teldi are, in spite of its low-level technology, the most self-motivated, independent, self-reliant, and widely trained group of beings that I have ever experienced or learned of through hearsay.

"There is no necessity for the level to remain low if the Scourge was removed," he went on, hoping that the unsteadiness in his voice would not be apparent in translation. "I am not a Master of the mechanisms which can do this work, nor have I any direct knowledge of the length of time required, other than that it will take many of your years. But the Scourge can be removed and you would be able to build again on the surface, and travel in safety, and grow . . ."

Martin broke off because he was talking to a three-dimensional picture again—there was absolute stillness in the room.

Slowly and deliberately he reached forward and gripped the hilt of the sword, then lifted it into a defensive position, diagonally across his chest.

Had he misjudged them? Was he about to misjudge them again?

He said gravely, "If the Federation was to set up examination and induction centers on Teldi at this time there would be very few beings judged Undesirable, and few also who would be accepted as Citizens. The great majority would be deemed unsuitable for the Federation World. I will explain."

The Masters were either touching or gripping the hilts of their swords now. Like the slave population of Teldi, they were proud, independent, self-reliant, and fantastically caring for the property from out of which they had risen to become Masters. Any criticism of that property was a personal insult to them.

"Teldi is a special case," Martin went on. "On Teldi it is said that there are never enough Masters, never enough able slaves willing to accept the crushing responsibility Mastership entails. In the Federation it is likewise said that there are never enough non-Citizens, and for very similar reasons: because

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the qualities required for the job are rare. It is my judgment that Teldins are not now and will probably never be suitable for Galactic Citizenship.

"It is my decision," he said in conclusion, "that the Scourge be removed and your world left alone for at least three of your generations. And it is my confident expectation that when the Federation next contacts you it will make a unique and most valuable discovery: a planetary population which is composed entirely of non-Citizens ready to assume extra-planetary duties and responsibilities."

The Masters were sitting still and silent, and suddenly Martin knew why.

"My arrival on Teldi was not a secret one," he said, lowering his sword and placing it on the Federation flag. As he resumed speaking, he slowly rolled the weapon in the cloth. "As a result, much hearsay will arise and more slaves will be impelled to rise to Mastership when they realize what was and will again be possible for Teldins. There is something I would like to leave with you, with your permission. . . ."

He walked slowly towards Skorta with the flag-wrapped sword held before him in both hands, then proffered it to the Teldin. Behind and around him he could hear the movements of Masters getting to their feet and the soft, rustling sounds of metal scraping against fabric, but he did not look aside.

"Martin," said the Teldin, taking the sword from him, "I am honored to accept the additional responsibilities of Master of Off-World Affairs and I, and my successors, will respect and promulgate the knowledge you have given us."

It did not say anything else and neither did the other Masters, but as Martin turned and began walking towards the entrance they remained standing, silent, motionless, and with their swords held high in salute until he had passed from sight.

On Teldi, silence was approval. It meant that there was no dissenting voice.■

● What an astonishing finding the Voyager record, this gift from the skies, would represent!... One thing would be clear about us: no one sends such a message on such a journey, to other worlds and beings, without a positive passion for the future. For all the possible vagaries of the message, they could be sure that we were a species endowed with hope and perseverance, at least a little intelligence, substantial generosity and a palpable zest to make contact with the cosmos.

Carl Sagan

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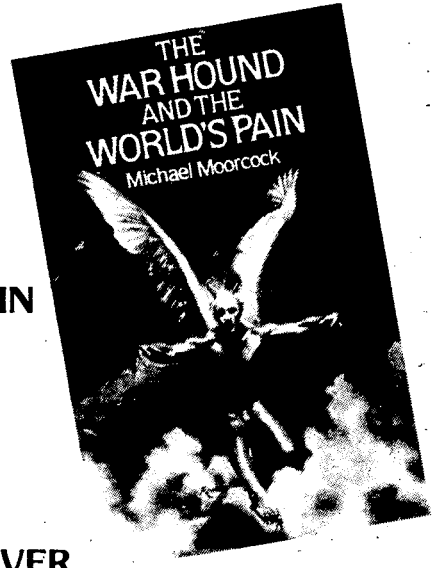

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THE HYBRIDOMA HORIZON

Daniel Basil Lyle & Dr. Robert Lundak

The same features which make
the body's immune system useful
in some ways make other
uses very difficult.
But there are ways
around difficulties, and
intriguing possibilities beyond....

Science fiction often describes future societies possessing extraordinary medical advances which are not available to our present-day world. In our visions of the future, truly effective anti-cancer pills are readily available. Organ banks contain a wide range of spare parts capable of rejuvenating the most shattered or diseased bodies. In cases of irreparable body damage, an individual's brain may be transplanted into a completely new, healthy body. Yet as desirable as this medical ability may be, to date, the technical basis for such extrapolations into the future has been meager. Currently, these medical advances are almost as farfetched as the dream of FTL (faster-than-light) star drive. But if these medical therapies could be perfected, the domain of human misery would be greatly restricted. If the thread-hung swords of cancer, failing organs, and decaying bodies could be set aside—what transformations might occur in *all* aspects of human society?

Happily, recent dramatic breakthroughs in medical research now offer a tangible hope of doing just that. Medical science is on the brink of a quantum leap in its ability to treat cancer, transplant rejection, asthma, arthritis, and many other immune-associated diseases. The high technology which now provides the foundation upon which to extrapolate towards a new plateau of medical therapy can be described as "monoclonal antibody-producing human hybridomas."

To understand this technology, one needs to appreciate two distinct biological entities: 1) cultured *cancer cells*, 2) the *antibody molecule*. Most of us are

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acquainted with the basic concept of the antibody, and know that it is important in helping to protect us from disease. Few of us appreciate its potential Jekyll-and-Hyde character. This is a key concept in comprehending the coming revolution in immunotherapy. In human disease-states the antibody molecule can manifest itself as either savior or fiend. This dichotomy is the crux of the matter from which is being forged an exquisite surgical cutting edge.

The Antibody As A Savior

The antibody molecule is a protein manufactured by your immune system and found in your bloodstream. These molecules have saved your life many times. A good example is the flu virus, which infects millions every year. The symptoms can be so severe that you may actually fear for your life. Medication obtained from a physician will help relieve the symptoms and prevent secondary infections from bacteria. The flu virus itself, however, is dealt with from within your body. The virus is recognized as being "foreign" by a white blood cell called the "B-lymphocyte." These first few cells which recognize the virus as foreign then begin to "clone out." This means that they repeatedly divide, producing thousands and millions of identical copies of the original cells. This "army" of cloned-out cells manufactures and secretes large amounts of anti-virus antibodies. These specially formed protein molecules recognize that particular flu virus as their target and attach to it. The attached antibodies then dramatically aid several white blood cell types in destroying the virus. The antibody level in your bloodstream becomes high enough to hinder the virus significantly at about seven to ten days after the virus is first recognized. This is the time that you usually start to recover from your illness.

Without that prompt antibody response to the foreign virus, your disease would probably progress to coma and thence to death. This would occur *in spite of* medications such as anti*bio*tics (different from self-made anti*bod*ies). Antibiotics, for the most part, are not effective against viruses (antibiotics are mostly made by fungi to protect them from bacteria, a fortuitous circumstance of Mother Nature which man has used to good advantage). Furthermore, though antibiotics are effective against many bacteria, usually the bacteria are not killed, but only slowed. A strong antibody response against the bacteria is *also* needed before the bacterial infection will be cured.

What of those who lack a good antibody response or whose ability to mount such a response has been severely compromised? When the flu epidemic hits, they are the ones that die: the old, the debilitated, the immune-depressed. An example of the immune-depressed are some cancer patients. Often, the chemical therapies used in the treatment of cancer suppress the patient's immune system as well as his cancer. The primary cause of death among cancer patients is frequently not the cancer itself but infection, often from bacteria. A suppressed antibody response exposes the patient to uncontrolled bacterial growth and destructiveness, again in spite of antibiotic drugs. Also, it is quite

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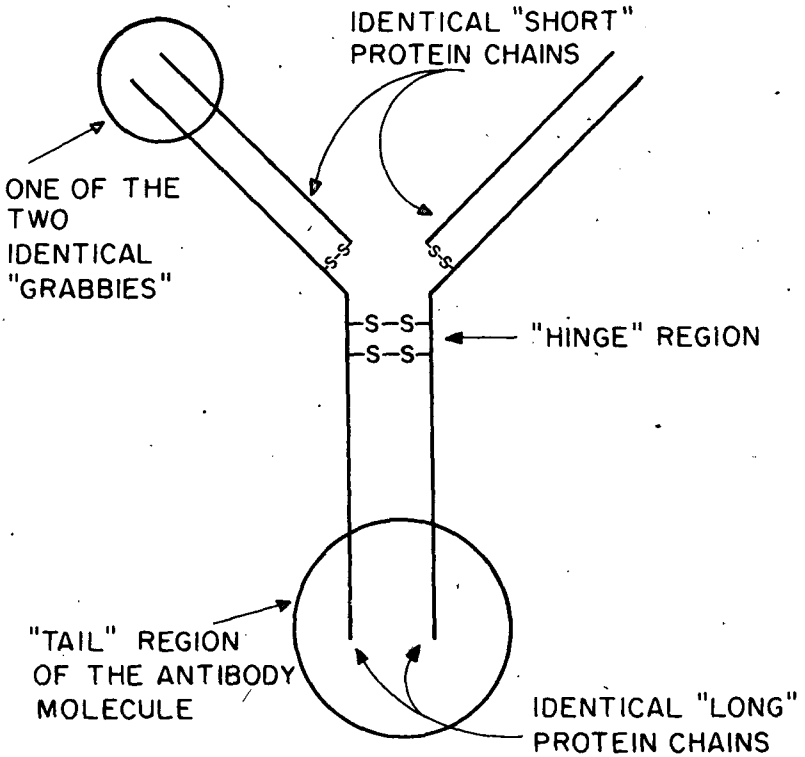

FIGURE 1: A TYPICAL ANTIBODY MOLECULE'S MAIN STRUCTURE---4 JOINED PROTEIN CHAINS

appropriate to note the converse. The normal immune system suppresses or prevents many potentially deadly invasions in your body, often without your even realizing that your defenses have been challenged.

How An Antibody Works

The crucial element, then, in both continual defense and in recovery from ever-present microbial infections, is the antibody molecule. To truly appreciate its beneficial rôle in protecting your

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life—as well as its destructive rôle, which we will get to shortly—we must ask the basic question: "Just *how* does the antibody do what it does?" To answer this question, we must first understand the structure of the antibody molecule. A typical antibody molecule is composed of four separate protein chains held together by sulfur chemical linkages, as shown in Figure 1. Two of the protein chains are "long" and the other two are "short." Both long chains are identical in the linear arrangement of the amino acids (protein building blocks) which form their structure. The two short chains are identical to each other but different from the long chains. The end portion of one joined long chain plus short chain is where the antibody molecule can attach to its "target." An arrangement of amino acids occurs at that region of the short and long chain which will recognize and attach to a corresponding chemical arrangement on the foreign virus or bacterium. Thus, at one end of the entire antibody molecule are two identical "grabbies," while at the other end is the "tail" of the molecule.

With two identical "grabbies" on one molecule, two separate invading microbes could be joined together by a single antibody. In fact, if the second microbe were to be attacked by still another antibody's "grabbie," then large clumps could be formed.

The white blood cell "trash collector" of the body then comes moseying along, a cell called the "macrophage" (or "Big Eater"). The macrophage has chemical receptors on the outside of its cell membrane which will recognize and attach to the tail-ends of antibody molecules. Thus triggered, the macrophage happily engulfs the virus or bacterial aggregate, internalizes it, digests it, and destroys it.

Another blood system, called the "complement" system, is capable of responding to the grouped tails of antibody molecule. "Complement" is the collective name of nine different protein molecules which are found in blood. When clumped antibodies attached to a cell surface occur, some of the complement proteins will attach to the antibody tails. This initiates a process by which still other complement proteins combine to form large complexes upon the cell surface. The final complement super-molecule punches a hole in the cell's peripheral membrane. This is important in defense against certain invading organisms. It can also be one of the harmful attacks mounted by your body.

The Antibody As A Villain

Antibodies can be very harmful to the body that they are supposed to be protecting. A prime example of this sad situation is the rejection of transplanted organs. This is a fairly understandable villainy, though, for the kidney or heart does come from *another* individual, and therefore is foreign to the host body. How is the host immune system to know that the foreign kidney tissue is not to be attacked just like a deadly foreign virus? It isn't. The immune system functions as it is programmed to. This is little consolation, though, to a patient whose life-giving donated organ is being destroyed from within his own body.

Even when an antibody response is

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directed against clearly foreign elements, the response still could be injurious to the host. Prime examples of this situation are asthma, hay fever, and other allergies. These illnesses cause untold misery to many people and can even kill. In all these cases an overwhelming and life-threatening response can be mounted against a relatively minor irritant. A bee sting, pollen granules, or a particular food can stimulate the unfortunate individual's body to drown itself, choke itself to death, or lose control of its blood supply and die of shock. The cause of these drastic over-reactions is a special type of antibody.

Even more subtle "villainies" of the antibody system occur. Antibodies can be produced within your own body which are *not* directed against foreign, invading elements, but against the normal tissues of your very own body. These "autoantibodies" can attack your thyroid gland and cause it to go wild, attack your kidney and cause it to fail, attack your intestines and cause them to malfunction, or attack your brain and cause it to shrink, leading to rapid senility and death. In "systemic lupus erythematosus"—commonly known as "Lupus" or "SLE"—virtually *any part of your body* may be attacked by autoantibodies. Perhaps the most widespread condition in which autoantibodies are involved is the scourge of *arthritis*, which affects 1 to 3 percent of Americans annually.

Autoantibodies are but one example of the creeping miseries which can occur when our life-saving immune system goes out of control. The immune system is an incredibly complex network of interacting cells and substances which say "attack now!", "attack thus far and no further!", "don't attack that, it's OK!", and "the attack is finished, switch off!". Specific clones of stimulated white blood cells may function in one particular immune reaction as "helper" cells or "suppressor" cells. When any one of these specialized control cells malfunctions, immunological disease can occur. Medical research is just now beginning to explore the labyrinth of malfunctions present in immunological disease states.

It is even possible for immune mechanisms to *assist* cancer in invading and destroying your body. There are molecules on the surface of cancer cells which the host body can recognize as "foreign." The body can use these molecules as markers against which to launch antibody attacks at the cancer cells, much as it would against any foreign invader. These molecules are referred to as "tumor-associated antigens" or "tumor-specific antigens." Other lymphocytes which are different from the antibody-producing B-lymphocyte can be stimulated by those tumor molecules to *directly* attack the cancer cells. Thus, there are a number of ways your body can attack the cancer cells growing within it. This is all very nice, and may be responsible for destroying many incipient cancers in our bodies even before we become aware of them. Unfortunately, the immune system can decide to "switch off" an ongoing attack on the cancer cells. Suppressor cells may start to function and result in turning off the production of anti-cancer antibod-

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ies, or shutting down anti-cancer lymphocytes.

Having described some of the horrendous disasters your immune system is capable of perpetrating within your very own body, let us now ask another basic question: "How has medical science dealt with these inappropriate immune responses or lack of responses?"

The vast majority of non-surgical therapies available today are "shotgun" therapies. In other words, if the immune system is overactive (lupus, arthritis, transplant rejection) drugs are given which nonspecifically suppress active cells (for example, corticosteroid drugs such as prednisone). Some drugs preferentially inhibit a general type of white blood cell. However, drugs are not yet available that will eliminate only one particular active clone of lymphocytes. Examples of clones you would like to eliminate are: 1) the suppressor cell clone which shuts off the anti-cancer response, 2) antibody-producing cells over-reacting to a particular pollen granule, 3) lymphocytes making inappropriate antibodies in arthritis, and 4) lymphocytes directly attacking a transplanted kidney. Since such exquisitely fine-tuned therapy is not available, current therapy results in many appropriate and necessary responses being inhibited as well as the inappropriate response. Also, the overactive clone of cells is rarely ever actually killed—simply slowed down.

Harnessing the Antibody's Schizophrenia

But wait. Is there not something in nature which *can* be directed against very specific targets? Say, against a particular type of virus? or bacteria? or cancer cell? or "virtually any part or element within your own body"?

That's right. Once again we're back to our old friend/enemy—the antibody molecule.

Why not produce antibodies against your inappropriately active white blood cell clone, and in an exquisite surgical strike destroy those specific cells and restore your immune system to its proper functional level?

But there are problems. We must produce *one* antibody and not a whole group of differently reacting molecules. We must have large quantities of this specific antibody. And we must be able to stimulate the production of such a specific antibody in the first place.

For years, the only way to produce an antibody was to inject the "antigen" (foreign substance capable of eliciting an immune response) into an appropriate animal an appropriate number of times, and after some set interval to drain blood out of the animal. The fluid portion of the blood, containing the desired antibody, was then isolated. But since many different antibodies are produced in any particular animal, this procedure at best might give a mixture of antibodies enriched for the one you want. Also, there is a limit to how much blood one can remove from the animal, and thus to the supply of the mixed antibody.

An effective way around many of these difficulties was achieved in 1975. For the first time, one selected antibody-producing cell was "immortalized" in the test tube! Normally, antibody-pro-

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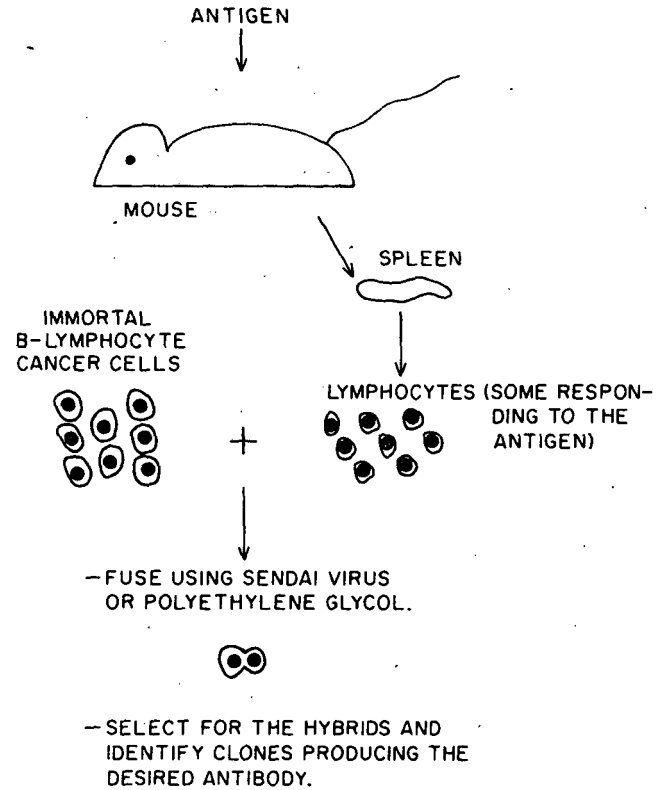

FIGURE 2: THE PRODUCTION OF MOUSE HYBRIDOMA MONOCLONAL ANTIBODIES

ducing cells taken out of an animal cannot be kept alive in the test tube for more than a few days. Now selected antibody-producing lymphocytes were propagated *indefinitely* outside of an animal by taking advantage of the "hybridoma."

A "hybridoma" is a *single* cell produced by *fusing together* two separate cells. Stimulated antibody-producing cells taken from a mouse injected with an antigen were fused with cultured mouse cancer cells. The resultant hybridomas contained the desired antibody-producing cellular biochemical machinery from the lymphocyte together with the immortality which is characteristic of cancer cells. (Cancer cells do not stop dividing as normal cells do.) The mouse cancer cell was well-adapted to living in the test tube, capable of growing to great numbers in

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that type of artificial environment, and amenable to the induction of desired mutations into its genetic makeup. Certain biochemical defects (arising because of genetic mutation) can be used such that, after the fused cells and cancer cells are grown in the proper media, only the fused cells will continue to grow. The remaining unfused cancer cells and normal lymphocytes die. By this means, literally buckets of dense cultures of one particular antibody-producing clone of lymphocytes (in the form of a replicating hybridoma) can be grown. Thus was created the basis for an explosive technology labeled "monoclonal antibody-producing hybridomas." These hybrid cell lines grow to very large numbers in an artificial environment, and manufacture one single specifically reacting antibody (see Fig. 2).

Monoclonal antibodies have already had a tremendous impact on industry and research. However, this impact has not yet been felt in medical therapy. Why is this? Well, let us consider another unpleasant example.

Say you had cancer. Let us further stipulate that your cancerous cells are isolatable in large enough numbers to remove from your body and work with in a medical research situation. Let us further assume that the cancer cells have recognizably foreign elements (tumor-specific antigens) upon their surfaces which do not resemble your normal tissues. A monoclonal antibody against your tumor antigens is then produced from *mouse* hybridomas. Since there are large quantities of this specifically anti-cancer antibody available, why not inject it into your body, destroy the remaining cancer cells, and rid yourself of this horrible disease?

Problems. First of all, your normal immune system will rapidly detect this mouse antibody saturating your system. The mouse antibody *itself* will be recognized by your body as being foreign and—that's right—you will soon be producing antibodies against the mouse anti-cancer antibody, thus effectively stopping the therapy. Secondly, even if the mouse antibody were to find and attach to your cancer cells before your body neutralized them, it probably would be ineffective anyway! Anti-cancer antibodies, where they do normally occur, are generally ineffective in killing cancer cells, and in some cases can actually block effective direct-acting lymphocyte attacks. This negative result is accomplished, in effect, by *hiding* the cancer cells by blocking off the tumor-specific antigens. The lymphocyte needs these antigens exposed in order to recognize the cancer cells as foreign.

Recently, investigators have succeeded in producing one of the world's first monoclonal antibody-producing *human* hybridomas. Lymphocytes from human tonsils were exposed in the test tube to a foreign substance (red blood cells taken from sheep) and subsequently fused with cultured human cancer cells. Hybridomas were recovered which secrete human anti-sheep red blood cell antibodies. Although human beings are unlikely to come down with an infection of sheep red blood cells, the same or a modified procedure could be used to produce human antibodies against virtually any desired foreign

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stimulator (such as viruses, bacteria, and tumors). An exogenously supplied human antibody is not rapidly neutralized within the body, as a mouse antibody would be. The patient's own lymphocytes can be used as the source of the cells to be exposed to the foreign substance, with the subsequent monoclonal antibodies being totally compatible with the patient's own body.

One way to overcome the problem of weak antibody killing, particularly against tumor cells, is to attach the antibody molecule by its *tail* end to a potent chemical poison. The attached poison will be carried to the desired target by the specific antibody—and there vastly increase that particular antibody's killing potential. Good results have been obtained in coupling a plant-derived toxin to a mouse monoclonal antibody. This combined antibody-poison was easily able to kill the mouse leukemia cancer cells against which the mouse antibodies were first produced.

The potential is now clearly present to attempt incisive, exquisite immunotherapy within the human body. The production of antibodies against one specific clone of cells has already been accomplished. The targeting of the clone of cells for destruction is possible because, for that one clone to be able to respond to a unique foreign substance, it must have unique *receptors* on its surface to *recognize* that foreign substance. Monoclonal antibodies produced against that receptor will destroy those cells which carry that receptor, and no others. Human anti-receptor or anti-tumor monoclonal antibodies coupled to powerful poisons may soon be a standard tool in the treatment of human disease.

In the not-too-distant future, transplantation of organs may become a common safe procedure, cancer could become an inconvenience of a few days' stay in the hospital, and allergies and arthritis could be treated by single injections. It may even be possible to administer antibody preparations in pill form. Thus we may not have to suffer through that week or so of agony before ridding ourselves of flu. Commercially prepared human antibody pills directed against that particular virus could be on the shelf and ready to be taken when the first mild symptoms hit. Immune systems that have been compromised may in the future be casually supplemented—so that the old or debilitated need not fear an untimely death from some common bacterial infection.

Who knows? Even man's most elusive medical milestone may be just around the corner: the routine cure of the common cold! The future physician may have at his disposal whole batteries of human-antibody anti-cold-virus pills. A rapid lab test to determine which of the many viral strains is present . . . a quick prescription . . . and the cold virus is neatly "bound up" and neutralized!

The molecular scalpel of the schizophrenic "monoclonal antibody-producing human hybridoma"—a cleverly forced association of specific antibodies and cultured cancer cells—is now poised at the human flesh. It may well slice its way to a renaissance in human health and well being.■

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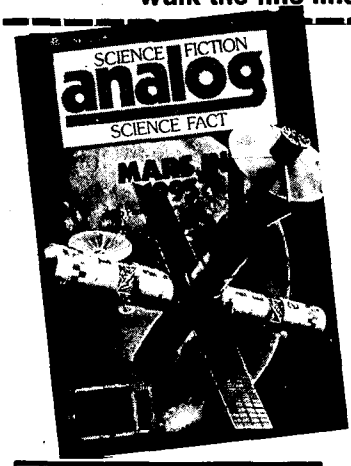
ABOUT THE AUTHORS

Dr. Lundak received his Ph.D. from the University of California at Irvine and is an Assistant Professor of Biomedical Sciences at the University of California, Riverside. He is currently engaged in several lines of medical research; a particular interest is the human body's immune defense mechanisms and human hybridomas. When he's not working in the laboratory, he can most often be found flying or puttering about in his greenhouse. His orchids have won many first-place ribbons; not surprising, as they were personally hunted down and captured in far-off corners of the world. Dan Lyle holds a B.A. in Biology from Stanislaus State College in California and is a licensed medical technologist. Currently most of his time is occupied being a Ph.D. candidate doing basic cancer research in Bob's lab. When not found mashing up human tonsils or growing tumors in mice, Dan can be found at home puttering about his reptile collection. Dan once tried to turn the university lab into a herpetarium, but Bob insisted there wasn't enough space for the snake cages among the orchid pots. . . .

Walk the fine line between Science Fact and Science Fiction



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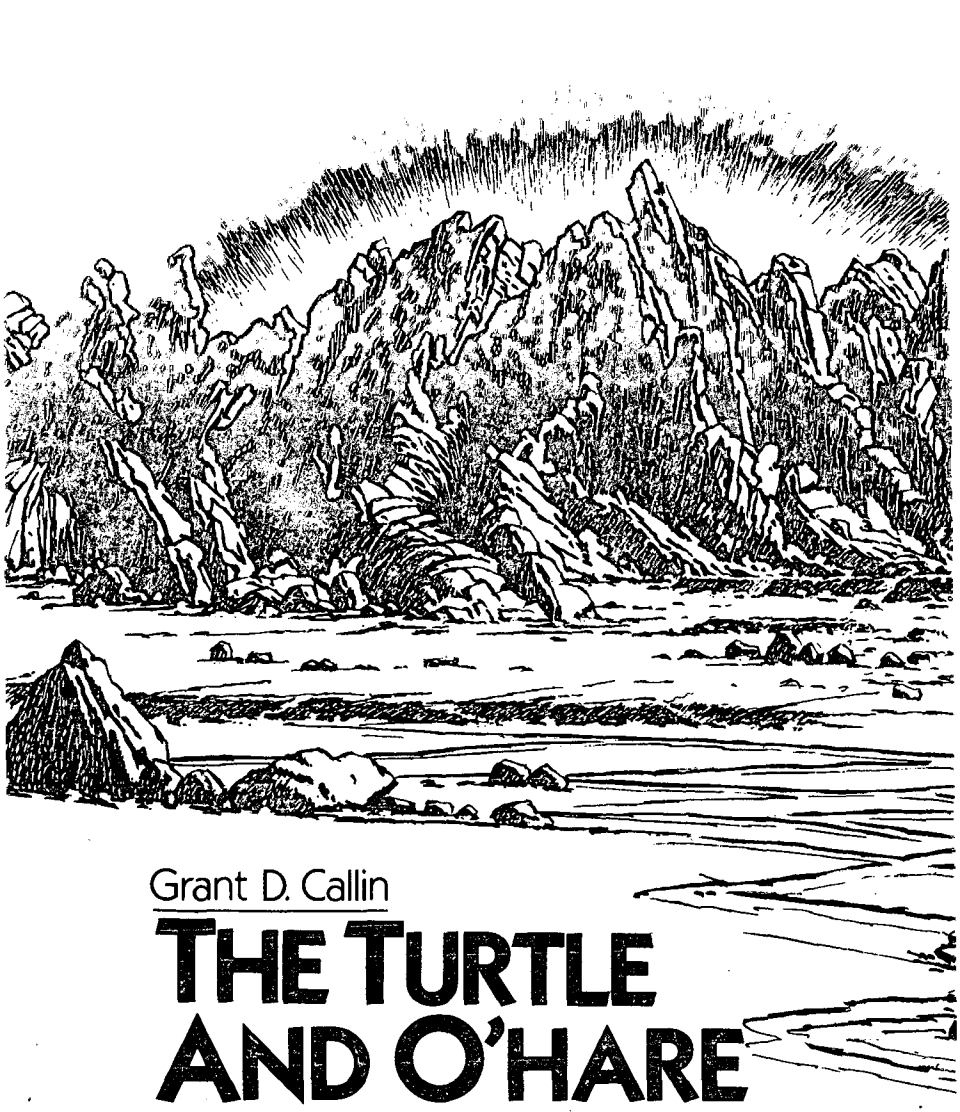

Grant D. Callin

THE TURTLE AND O'HARE

Alien environments are likely to pose plenty of direct dangers. But even more important may be the indirect ones, when the human body and mind are simply driven beyond their ability to function normally.

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He scuffed Mercurian regolith with a booted foot and squinted back at his useless ship. Dawnline cut the stubby vehicle in half. In about one hour that line would move down and kill him. William O'Hare: angry and scared.

He looked at the watch strapped to the outside of his micropore suit. About 24 hours to sunrise at the stalled crawler; call it 70 kilometers. Nothing to it; back at SpaceHome 6 he'd done the hundred-kilometer walk in less than 20 hours, under nearly identical gravity conditions.

But he'd been younger, then, and fresh; now he was already tired from a restless, cramped trip from Earth orbit, and from an adrenalin-pumped fight with a broken landing computer. He was still jacked up, but that would wear off soon enough.

O'Hare turned around and started to walk, fighting the urge to break into a run. He carried a full liter-bottle in each hand; they made clumsy pendulums of his arms. But he didn't begrudge the weight; in fact, he would have carried four if there had been any way to rig it in time. The micropore suit would suck water from his body at a prodigious rate, and the nearest emergency supply dump was almost as far as the crawler itself.

He had one consolation in being so close to the dawnline: the corona itself served as his light source, so he didn't have to carry a flashlight. As long as he was careful with the tricky backlighting, he shouldn't have trouble navigating.

The crawler track stretched wide and straight west along with his fuzzy shadow and faded into the darkness over the close horizon. O'Hare had lived so long in the colonies that traveling a convex surface was a little scary. He'd gotten used to it while building the crawler, but two years had gone by since he'd made a planetfall. He shuddered, but didn't slack his pace.

One hour. Two. The adrenalin was long gone, and unaccustomed muscles settled into dull aches. His eyes were tired from straining into the ghostly coronal light. He was long past hating the supposedly fail-safe landing computer —and by now well into hating the crawler itself. It had no business breaking down, and he had no business being the one to troubleshoot. Well, maybe he had; he did go 'way back with the project. . . .

"Hey Mom, this article says that we don't really need to build the Mercury Crawler, and that we can get all the rare metals we need from the Moon or Earth, and that it's a waste of money, and it'll raise the microwave power rates to Earth, and that we don't really need to build SpaceHome 6 at all, and that—"

"Billy, please! I'm a doctor, not an economist. Go talk to your father—but hurry; there's only 20 minutes to liftoff."

"—Hey Dad, this article says that the Mercury Crawler is a waste of time and money, and that we don't really need to build SpaceHome 6, and that—"

"Whoa, boy! You're running ten klicks a minute. Here, let me see that thing. Oh. God save us from Sunday supplement writers. Listen, Billy, we don't have time right now to go over all these distortions and misquotes. Let me ask you something instead: Where are we headed right now?"

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"Earth orbit."

"Right. And then where?"

"SpaceHome 4."

"Right again. And why are we going to SpaceHome 4?"

"'Cause there's not enough room in SpaceHome 5!"

"No, no; I mean, what's the reason for all of us going?"

"To build 'Home 6—and then the Crawler!"

"Gold star, Billy. Now listen: Do you think we'd move all these people and do all that work and spend all that money if we didn't really need to do it?

"Nooo . . . I guess not, but—"

"Enough buts for now, son! We'll talk about it later. Right now this shuttle is going to lift off, and you've got to get strapped in. So hightail it back to your seat!"

"Okay, Dad. Thanks . . . and I didn't really believe that story anyway. I . . . well . . . I was just a little scared and wanted to talk. . . ."

"We'll be in Earth orbit before you know it, Billy."

O'Hare pulled out of his reverie. It was foolish not to concentrate his full attention on the path, even though it was well graded. He raised his arm to look at the watch; it was an effort to lift the half-full liter-bottle. Five hours gone. He estimated that he was over a third of the way there.

He'd been lucky, so far; the going had been smooth. He looked up along the crawler track. It was easily discernible by its remarkable lack of any rocks over a couple of centimeters in diameter.

Presently the track was about a hundred meters across. Smooth and sure, it glided into the black ahead. The crawler was on its fourth working pass, sampling a 25-meter-wide swath each time, looking for high-grade regolith to mine more heavily on subsequent passes. Since the path was wide here, it must be a low-grade region.

He'd made good speed, and that was important. The geometry of his survival was straightforward, and very deadly. Mercury was about 90 degrees from perihelion, so the terminator was moving to overtake him at about 3 kilometers per hour. The crawler represented safety, but it was 45 or 50 kilometers down the track. Things could have been worse: Near aphelion the shadow line moved at about twice its present velocity, and he wouldn't have a chance to outrun it. On the other hand, it could have been a lot better: Near perihelion, the terminator slowed dramatically—and even reversed direction for a couple of hundred hours at closest approach.

They called the terminator "the turtle" because it moved so slowly around the planet—a phenomenon of orbit and two-thirds tide locking. The turtle: a knife-edge of survival, with safety in the shadow and death by radiation on the other side. And he was in a race with that turtle. O'Hare chuckled as the irony of his own name struck. No rabbit's tactics for him; if he were to prevail, it would be at a steady pace. A medium walk from death to life. The turtle had a good chance to win the race, because it had allies: fatigue and thirst. His own allies were a little less reliable, because they might desert him in the long haul: intelligence and resolution.

Thirst. He licked his lips. He needed

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another drink, badly. At the thought of stopping, however briefly, he glanced back along the track to look for telltale signs of sunrise. The light from the corona seemed blinding; he blinked tears and twisted his torso back around. Too rapidly; he stumbled with the sudden shift in momentum and righted himself just in time to keep from taking a header.

Shaken, O'Hare stopped and forced himself to calmness. His legs ached; he wanted desperately to sit down, but he couldn't. The micropore suit was thin; its shiny surface protected the body from heat loss by radiation—but it conducted heat quite well. The only insulated parts were the gloves and boots. If he sat down even for just a few seconds, he risked frostbite and suit damage; the surface of the planet here had been in shadow for more than 87 days, and it was *cold*.

Thirst. Hands trembling a little, he set the full liter-bottle on the ground and screwed the half-full one into his faceplate fitting. Slowly he turned the activation knob until the gas expansion piston was forcing water through the nipple at a fast drinking rate. After what seemed only a couple of seconds, the bottle was empty. O'Hare grimaced. He had meant to save half the remainder for at least two more hours. Disgustedly he threw the bottle away.

He looked back along the track, squinting against the coronal glare. The terrain was smooth and black, giving no hint of the coming dawn. He guessed that he was about four hours ahead of sunrise.

O'Hare turned his back to the corona and began to walk again. His legs shrieked with pain; they had cooled off dramatically in the brief period of his stop.

Another hour. Another two. The track ran wide for several kilometers, then narrowed abruptly as a sharp rise appeared on the horizon. O'Hare barely noticed. Fatigue beset his mind and body from all quarters. The ache in his legs was intense. Resolutely, he would contrive to ignore this, only to become aware of the tiredness in his hands and arms. Changing the carrying arm of the liter-bottle only seemed to make things worse. He would will away the arm-soreness only to feel the deep ache in his shoulders from the constant drag of the backrack. Then the focus would move to the small of his back, then down to his legs once more. And whenever he managed to put them all away, there was still the heat of his body, and its terrible thirst.

Hot and thirsty, hot and thirsty. It became a chant as he walked; he used it as a dare not to break into the remaining bottle of water, to husband his strength and courage. He could have chosen to wear the full-pressure suit, and would have then traveled in air-conditioned comfort; but that was the choice of death. He would pay for his life, if he lived, with heat and thirst. It was a choice he'd known for twenty years. . . .

"You kids'll be working in vacuum to build the solar collector at Home 6, or the Crawler on the surface of Mercury. Either way, you're gonna have to learn to be as comfortable in V-suits as in your skin here in the colonies.

"So I've got three weeks to turn you kids into vacuum freaks. Yeah, I said

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'kids'. Sure, you've got your full growth, or else you wouldn't be here. But as far as I'm concerned you're all kids until you show me you can handle yourselves responsibly in vacuum.

"See that sign up on the wall behind me? You can't miss it—and that's on purpose. That sign is no joke; it's our Bible—and it better become yours. We've had forty-seven vacuum-suit deaths in the history of the colonies, and all but two of 'em happened because some horse's ass had his head screwed on in the wrong direction. 'Scuse the language.

"Now let's get down to business. We'll start at the beginning: There's two kinds of general-purpose suits—full-pressure and micropore. Here in Earth orbit the micropore is most common because we don't need the protection provided by the full-pressure suit.

"The problem with micropore is that you get hot and thirsty. Hot because the suit reflects body heat right back into you, then cools you by evaporating your sweat into vacuum through the pores; so in order for the suit to work, you gotta get hot enough to sweat. And thirsty, naturally, if you sweat. So you should always be near a water supply when you're in a micropore, because it's easy to get dehydrated.

"The full-pressure suit doesn't have that problem; you get cooled by the suit air supply. But you only get six, seven hours of V-time before you have to recharge. That's 'cause most of the gas you lug around in the pliss is for one-time cooling and dumping.

"But even though the full-pressure suit is more expensive and wasteful, you'll need its thermal protection when you're working on the sunlit side of the Moon, or anywhere inside Venus orbit if you're gonna be exposed to sunlight. And God help you if you're caught in Mercury sunlight with only a micropore: You'll fry in one hell of a hurry.

"Now in this course you're gonna learn everything about both kinds that I can cram into your heads in sixty hours of instruction. When I'm done with you, you'll be able to do everything from poach an egg to pee in 'em, if you'll excuse the expression. . . ."

O'Hare burst into reality as his feet lost purchase on the ground and he began to fall backward. Miniquake! He realized what was happening just as he lost the fight to retain balance. Reflex took over; he dropped the water bottle in time to twist his torso into a front-fall and break his downward momentum with both hands. There was a moment of supreme muscle-wrenching as he put his strength into an effort to allow only his gloved hands to touch the ground.

He almost won; but his twisting had imparted too much angular momentum to his body. As he broke the fall, his torso continued to roll. His left arm gave away and was ground into the regolith before he bounced up and came to a standing position. He felt a sharp pain in his upper left arm. Awkwardly he raised and twisted the limb to view it out of the side of his faceplate. There was a tear in the fabric about one centimeter wide and one-and-a-half long; blood was boiling into the vacuum.

Fear-bile rose in his throat. He fought panic, reciting the manual as a liturgy: Move rapidly but carefully. It is probably not as bad as it appears. Unless a

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medium/large vein or artery is severed, there is ample time to re-establish integrity, either by moving bodily into pressure, or effecting a field repair *in vacuo* (see below). Report yourself off-duty and seek aid from a medic or physician as soon as possible.

O'Hare chuckled at that one, and was under control again. He opened the field repair kit on his right hip, found a two-centimeter roll, and shook it out. One side of the stretchy strap was smooth, except for a Velcro patch at the very tip; the other side was covered intermittently with patches of Velcro.

Working clumsily with one hand, O'Hare measured off the correct length with a trial wrap on his arm, took scissors from the kit, and cut the strap to length. The bleeding arm was beginning to feel cold and achy; his neck hurt from twisting to see the working area. Cursing under his breath, he somehow got the band in place.

Now the hard part: The suit imposed a pressure of 350 gsc over the entire body below the neck; he had to match that pressure with the patch. Too loose and the bleeding would continue, too tight and he'd have a tourniquet. He closed the strap carefully, using his left side as a clumsy second hand. Tentatively he moved his arm with the strap in place. Too loose. He swore again, clamped his arm to his side and pulled the Velcro tab loose. Fighting pain and the still-bubbling wound, O'Hare replaced the strap and fastened the end tab two centimeters tighter than before. This time he was satisfied with the result. He flexed his arm to bring sweat up through the pores and set the patch in place.

As O'Hare walked over to pick up the water bottle, he found that he was shaking so badly he could hardly stand. He stopped, forced out three deep breaths, and blinked slowly. The horizon swam around him, then settled down as his mind steadied.

He looked at his watch. Nine hours gone. Then, turning around, he noticed something he'd missed through fatigue and hypnotized walking: About half a kilometer ahead, the ground rose abruptly and the regolith became lighter. The track climbed a steep hill, topping it about a kilometer away. As he watched, the top of the hill broke into sunlight. He began shaking again, his heart hammering. The sunline was moving down toward him fast enough to be noticeable.

Once more, O'Hare forced his overloaded system to slow down. He could die from overreacting just as surely as from sunrise. It should be several hours before that deadly sunline reached the top of his helmet. He made himself think rationally, driving his brain to remember horizon formulas. Diameter in thousands of kilometers was the multiplier; for Mercury that was 5. Multiplier times height in meters, then take the square root. If he stood one-point-eight meters at the eyes, his horizon was three kilometers—a figure he remembered from his working days building the crawler. Very well, his head was back in gear again.

He set about working his survival geometry in terms of altitude. When he'd started, the sunline was nearly ten meters up on his—damnable!—ship; so it was about 7 kilometers from the terminator. Since then he'd gained about two klicks per hour on the turtle, so he

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was now about 25 ahead. Square that and divide by five to get sunrise altitude; call it 125 meters—the height of that hill above mean terrain. He realized that he'd been lucky, in a way: if he had encountered such an obstacle at the start of his journey, he might not have negotiated it before the sun caught him. Lucky. Right.

First things first. He retrieved the liter-bottle and examined it; the plastic cap covering the nipple threads was cracked. Suddenly worried again, he took the cap off and inspected the threads; they seemed okay. Just to be sure, he tried screwing the bottle into his faceplate; it worked. Before he could stop himself O'Hare had drunk up half his remaining supply.

Guiltily he unscrewed the bottle and replaced the cap on the threads. He'd needed that shot of water badly, but before his journey was over he'd probably need it worse. He suspected that the first 40 or 50 kilometers had been just a warmup for what was to come. He desperately wanted to stay on the easy track, but now that was the way of death—a death that was even now only about a hundred meters overhead.

Time to get going. He looked left and right of the crawler track. About 500 meters to the south the hill dipped well down into shadow. He angled off the track toward the cut.

Once again muscles shrieked protest as he started. The pain-dulling adrenalin had washed out of his bloodstream by now, leaving all of his aches intact—and seemingly amplified. To this was added the new problem of an ungraded trail. Occasional rocks barred his way; patches of deeper regolith slowed his feet and broke his stride. Small craters had to be negotiated or avoided.

Finally he came to the point where the hummock could be topped safely. Wearily he climbed up and over and looked back to the north, seeking the crawler track; then groaned out loud as he saw it. Half a kilometer away the smooth path, coming off the first rise and dipping into shadow, climbed an even higher hill. A full 200 meters of the track was in sunlight.

Almost crying in frustration, O'Hare dropped down into the swale between the two ridges and headed to the south once again. Now that he was up off the plain, the going was much worse: Rocks were abundant and regolith deeper. This time he examined the small craters carefully as he skirted or walked through them. Some were ovals, with the long axes pointed toward the corona. Once he passed a line of them, strung out toward the east; it was definitely a secondary crater chain. Somewhere to the west was a large impact crater. The reason for the hummocks was now obvious.

As he continued bearing south, O'Hare reviewed the briefing he'd gotten from Crawler Authority. The crawler was stalled at the loading dock of LMA 12. The linear mass accelerator was situated in the smooth plains region some 600 kilometers west of the rim of Caloris basin. That explained why there were no gradual clues as to the presence of the nearby crater. The lava flow resulting from the Caloris impact had filled the terrain nearly up to the lip, obliterating all of the ejecta he should have been seeing for the last ten or twenty kilometers. Only the series of concentric

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hummocks near the lip remained. And the crater itself, of course.

O'Hare was touched by a new fear. If the crater were intact, and as much as 25 or 30 kilometers in diameter, he was a dead man. He didn't have enough water or stamina to skirt such an obstacle. One thing gave him hope: if it were much more than 20 kilometers across, it would have terraced inner walls and a central peak. These were considered major decision obstacles for the crawler; if any such feature were near one of the LMAs, he was sure he'd remember.

He found the going very difficult, even in the greater illumination from the sunlit rise to the west. Avoid small craters. Walk through larger ones—carefully. Struggle up slopes; don't slide down too fast. Watch out for rocks. Try not to get dust above the boot-tops. And above all, keep moving; too tired to move is too tired to live.

As he continued to bear south in the valley between the two hummocks, O'Hare was looking for a particular feature on the ridge to the west: a negotiable pass low enough to be safe, but high enough so that he could get a good look at the terrain beyond. After half an hour he found what he was looking for. Up to the right was a cut in the hummock; the pass stood about eight or nine meters below the sunline. A sixty-meter climb. He wasn't sure he could make it; but he had to have that view, had to know his adversary. Cursing, he struggled upward.

Standing at the top, out of breath, sweat pooling at the neck-ring junction between suit and helmet, O'Hare stuck his hand over his head. With arm at full extension, his fingertips just reached sunlight. That gave him only a few minutes. He controlled trembling legs, breathed deeply, and studied the landscape to the west. There were two more crests between his vantage and the summit ridge. That must be the crater lip; it stretched from horizon to horizon. He estimated the crater to be at least ten kilometers in diameter, perhaps even fifteen or more. A kilometer to the north, the crawler track topped the final rise before plunging into blackness.

O'Hare looked at the track and licked his lips. The crawler was very smart; it remembered in detail every bit of the 15,000-kilometer circuit. On successive passes through rough terrain, it didn't widen its path; instead, the crawler graded it to make future passes easier. Already the track cut deeply into the crests, and the valleys were being filled. Fifteen or twenty passes and the crawler would have a straight cut through the rim, with the extra soil pushed over the lip to make the descent gentler.

He licked his lips again. O'Hare yearned for that track with every aching muscle. It represented the shortest, easiest path to safety—the road to survival. But fully half a kilometer of that track was in sunlight—all uphill. That meant at least five or six minutes of exposure. And that meant first-degree burns and loss of suit elasticity and integrity. And probably death within the hour.

He looked for a nearby gap in the crater rim. Nothing. He'd have to go around. Shoulders drooping, he turned back east to look for a route. Just then, an intolerably bright spark appeared on the eastern horizon. Hastily, O'Hare dropped down the slope a meter to complete his survey. There was no clue as

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to which was the shortest way around, so he'd keep bearing south. He looked south along the valley through which he'd been traveling; after a kilometer or so, it rose to meet the sun. He'd have to retreat back down to the smooth plains, to buy safety by losing altitude. He looked back the way he had come into the valley half an hour ago; the pass he'd taken was already in sunlight.

Fear-sweating again, he desperately surveyed southward. There! About 300 meters up the valley, a gap in the eastern ridge. The sunline was about ten meters above the lowest point of the pass. That gave him about 20 minutes; five minutes less to give him a two-meter clearance.

Hurry! Skree downslope—careful, don't drop the water bottle! Rocks, small craters, larger ones; slopes and soft spots. Be careful, but do it faster! Up the final slope to the left. Into the pass; a moment of blinding light, then a scramble in sudden darkness down to the plain below.

At the bottom O'Hare put the bottle down and rested with hands on knees. His heart was hammering, his breathing so labored that the overloaded helmet regulator popped his ears with every exhalation. After a few minutes he decided that he wasn't going to die after all. He checked his suit for damage; he remembered going down on hands and knees once during his flight. There were no signs of tearing, but the shiny surface of the suit was covered with dust below the knees. He brushed it off as well as he could.

O'Hare picked up the bottle and looked at the ridge he'd just quitted. The 90-meter drop had bought him about seven hours of life. He was going to waste two of them—maybe more—traveling a circumference instead of a diameter.

He turned south and began walking. Compared to the terrain he'd just left, the going was easy: level ground, old lava covered with a few centimeters of regolith, and some rocks and craters—but no ejecta from the big hole to the west. O'Hare needed easy going; that dash to safety had used up reserves.

One, then another, the aching hours stretched behind him. As the corona moved from his left shoulder around to his back again, he fought thirst with every gram of willpower he possessed. Time and again he slowed and started to bring the liter-bottle to his helmet, then shook his head and resumed pace.

Thirst was one thing; weariness another. He would almost—but not quite—give his life for a chance to lie down for an hour's sleep. His tiredness was so intense it almost had texture; he'd never known anything like it. Well, once before, maybe; but that was only a shadow of this reality. And, that other time, he'd only *thought* it was a life-and death matter. . . .

". . . your final examination in Colony Economics. The booklets I've passed out describe the exam in detail, but I'd like to go over some of the highlights with you.

"I want a sound, reasoned economic defense of the Mercury Crawler, as opposed to the alternatives listed on page two: a similar Lunar-based operation, an Earth-based seawater straining operation, or an asteroid belt 'search-and-mine' operation.

"For your analyses you need con-

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sider only the first twenty entries on the Colony List of Critical Rare Elements, given in Appendix A. Asteroidal, Lunar, Mercurian, and seawater assays are given in Appendix B.

"Referring to Section II, you'll note that you are to use the 15-station plan, with LMA and solar collector field at each station. Crawler discharges its load and recharges its storage cells at each station. Crawler follows terminator at an average seven days past sunset. And so forth. You will consider this plan against the Earth, Lunar, and asteroidal alternatives, giving productivity timelines and cost break-even points as described in Section III.

"A final word. You'll have—Mr. O'Hare! Your eyelids are drooping. Sleeping off a hot date again? As I was saying, you'll have twenty-four hours to complete the exam. And if you don't take at least eighteen, you're not trying hard enough. And, Mr. O'Hare, considering your present state, I can only pity your condition tomorrow. . . ."

Another hour. Another two.

Something caught the corner of his eyes; he looked to the right. It was some time before his dulled senses interpreted the sight. A gap in the crater rim, right down to ground level. The floor of the smooth plains fed directly into the crater. O'Hare knew that for some reason he should be angry about that, but he couldn't remember why.

Instead, he realized that he was squinting hard as he looked; the corona was almost directly over his right shoulder. That was important. (He stumbled on a small rock and automatically caught his balance on rubbery legs.) It meant that he was traveling due north now. At any time he could expect to see the crawler track come into view. And then, a left turn and a straight run to safety. Safety. . .

". . . crawler is a truly enormous undertaking. A thirty-thousand-ton, precision, self-operating entity. Batteries and brain; miner and refiner. And emergency living quarters for six, with three man-years of supplies, shielded even from full sunlight at perihelion. It represents safety, my friends. Economic safety for the SpaceHome colonies. And more importantly to you of the construction crew, life support safety . . ."

There, up ahead, dim in the distance. Hanging in the black sky, a side-lighted spiderweb. O'Hare squeezed his eyes shut, then opened them again. It was there, and real. The LMA, orbital insertion end. O'Hare stared until his eyes watered. His legs moved numbly after fifteen hours of holding up his body and pulling it along without rest. His brain, too, was numb with fatigue. He cudgeled it into slow operation.

The struts supporting the toprails were barely visible, though he knew they were ten centimeters in diameter and painted a high-reflectivity white. He traced the tinkertoy structure to where it disappeared under the horizon to the left. The LMA was ten kilometers long, constructed so that it compensated for the planet's surface curvature to provide a geodesic launch vector. The toprails formed a tangent to the surface; and at the touchpoint—the crawler.

O'Hare resolutely put thoughts of safety from his mind and tried to judge

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the apparent height of the LMA where it ended almost directly in front of him. It seemed to rise nine or ten meters above the horizon; that meant about half of it was hidden from view. At a guess he was six kilometers from the structure.

Those six, plus ten to safety. In his condition, that meant at least four hours of marching. He tried to groan, croaked instead. He honestly didn't think he could make it; he'd been running too long on reserves.

He licked his lips and tasted salt. He had to have a drink. He stopped walking, uncapped the liter-bottle and screwed it into his faceplate, trembling with the intensity of his thirst. He actuated the expansion piston. Nothing happened; the bottle was empty. He'd taken a drink a couple of hours ago, and must have drained it without knowing. Since then, he'd been carrying an empty bottle.

Rage bubbled up weakly, then was strong. Rage at his stupidity, at doing all that extra work for nothing. And most of all, rage at being cheated out of that last drink. But it was too much emotion to sustain. Anger faded to self-pity, with overtones of fear. Then everything was gone but weak resolve. If he couldn't make it, he couldn't. But he'd go on a little longer, anyway. O'Hare let the bottle fall and walked away on unsteady legs.

"You know the crawler's been broken comin' on to 75 days now, Bill."

"Who doesn't? Been to Control three times myself, trying to help the computer experts psych the problem. No luck."

"Well, you know the original plan in case we couldn't get it fixed by sunrise was to let it sit through one daylight cycle, then send a team to get it operational during the next dark."

"Yeah."

"Well, Control's come up with a second contingency plan: send one man in a small ship right away. He gets there with 20 or 30 hours of dark left. If he can get it running in time, he sends it merrily on its way in 'hurry-up' mode till it gets back in synch, then he takes off in the ship before sunrise. And if he can't get it fixed, he sits out the daylight period in the emergency living quarters, and we send the team as planned next dark."

"You'd lose the one-man ship. The sun would fry it."

"Control's willing to take the chance. There's big bucks involved."

"Yeah, but who's gonna be the poor bas— Now wait just a minute, Ted. You're not getting ME to go on that goosechase! I've done my time in the crawler. If you think I'm gonna go sit in that thing for three months, you're crazy!"

"Bill, we're taking a calculated risk, and the calculations say pick the best man for the job. That's you. You know more about the crawler from a practical standpoint than any man alive. Furthermore—"

"Ted, do the letters 'F.O.' mean anything to you?"

"As I was saying; furthermore, there's a twenty-thousand-dollar bonus attached to the deal. Ten just for making the trip, and ten more if you can get it running and we don't have to send the team."

"On top of regular vacuum pay and Mercury hazard allowance?"

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"Yes, dammit! Does that mean you'll do it?"

"Hell, yes. You knew I couldn't pass up those kind of bucks."

"Good. Your ship leaves at midnight. Report to inbriefing at nine; that's . . . two hours, forty-five minutes from now."

"Wrong. I leave at ten in the morning. Briefing at seven."

"Dammit, Bill, that midnight takeoff's for your benefit, so you can keep acceleration down to colony G's and still get there with 24 hours of dark to mess around in."

"So re-compute for a tenth more. Four-and-a-half days at point-four G's isn't gonna kill me."

"Okay, okay. Why the bug, anyway?"

"Two things. First, I've got a date with Svetlana tonight—and I'm sure as hell not going to break it now. Second, I don't rest very well in those damned one-man ships, so I'm gonna get some hard sleep while I can." Sleep while I can. Sleep . . .

The jar of his hands hitting the regolith woke him with a dull shock. He blinked rapidly for a moment. The entire front of his body was incredibly cold. Realization hit him; he scrambled to his feet, stood with heart pounding. His body was one immense ache. Thirst assailed him like a demon. He knew he was going to die, but the thought of oblivion was nice, somehow.

Then a tiny spark of resolve formed somewhere deep in his ego, just a ghost of the thing that had kept him going for so long—but enough to put him in motion. He brushed clumsily at the dust covering the front of his suit and looked around with clouded eyes. Back along his route an irregular line of footprints scuffed the crawler track, fading and disappearing over the bright eastern horizon. He squinted in the hard glow of the corona. The LMA stretched beside the track, ruining perspective by fading up into the light instead of vanishing over the horizon.

O'Hare turned to the left. Through the LMA framework he could see the solar collector field stretching to the west, north, and east. He'd come much farther than he would have thought possible. Most of the past few hours were a blur. A gap in the crater's western rim, through which LMA loads were shot to avoid impacting. The dull relief at reaching the crawler track, then a long march without memory.

He peered up at the LMA. The toprails were only a few meters above his head. Hardly daring to hope, he turned his gaze eastward. There, on the strained edge of visibility, a familiar shape: the crawler's microwave dish sticking up above the horizon.

Five, maybe six kilometers. He started walking. His legs almost collapsed with the first step, but somehow he kept his feet and continued to move. He knew he couldn't make it, but he was too close now to just lie down and die. He stumbled again and nearly fell; sobbing, he recovered in time to lurch forward instead of collapsing.

There was something he should remember, something important. Frantically he whipped his slow-motion brain: The dump, that was it. The emergency supply dump. There was one at each LMA, loaded with goodies. Like oxy, which he didn't need. And like water:

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He licked his lips with a dry tongue. The supply dump would be about a kilometer nearer than the crawler. He'd thought about that earlier, when it didn't seem to be important; after that, the crawler itself had become his obsession. Now the dump dominated his thoughts. It became his final marching song. Walk to the dump, to the dump, to the dump. He stumbled on, helmet regulator popping in time to his labored breathing. . . .

An hour, and then some. His knees were bruised from the falls; it didn't matter, since he couldn't feel them anyway. Miraculously, the suit was still intact; he didn't really care. His thoughts were focused only on taking each next step.

And then, somehow, it was there. To the right, just off the track, a large box. A meter tall, two wide and one deep. The shape of salvation. O'Hare stumbled toward it. He tripped at the edge of the track, fell, and got up without realizing it. Then he was at the box, forcing unresponsive muscles to strip off the heavy insulating cover and throw it on the ground. Numb hands fumbled at the latch, then a grunting heave got the lid up. He grabbed a liter-bottle, somehow got the thread-cap off.

When he tried to lift the bottle to his helmet, he found he couldn't balance himself with both arms raised. He sat down heavily, feeling the insulating cover under his buttocks. Again he raised the bottle to his faceplate fitting. His arms trembled so badly he couldn't get the threads started. He sobbed in frustration.

Then, a stroke of genius. He lay on his side and braced the bottle on the shiny tarp next to his helmet. By tilting his head at the right angle he got the threads started in the fitting, then screwed it home. He remembered one final thing: drink slowly.

William O'Hare lay curled on his side on the tarp, one arm curved up to work the piston knob. Water sucked into his mouth and spread into his throat and stomach. When the liter-bottle was empty, he relaxed his arm and dropped into oblivion.

A kilometer to the west stood the crawler. A gleam of sunlight showed from its topmost antenna. . . .

"—what the hell! This landing computer's going screwy! Great Christ—the damned thing's taking me toward the turtle! Hitting emergency override and bringing her down manually! Do not respond to this transmission; repeat; do not respond. Don't know how long I'm gonna be busy. . . .

". . . Okay, Crawler Control, this is O'Hare and here's the situation: I've grounded 60 or 70 klicks due east of the crawler. Only the altitude control malfunctioned, so I stayed in the plane of the ecliptic; landed right on the crawler track.

"I can't sit tight; I'd fry before a rescue mission got here. So I'm getting out, fast, on my own two legs. Micropore suit. No time to rig a double backrack, so I'm loading up with 36 hours of oxy and carrying two liter-bottles by hand.

"Don't bother to respond to this transmission. I'm signing off right now—gotta run. A bit of sun just popped over the horizon; I can see it through the window. God, it's bright! Really dazzles the eyes. . . ."

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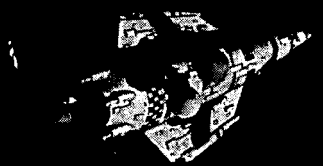
COME



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* * *

The reflection from one of the LMA girder plates crept into O'Hare's left eye, half-waking him. He tried to turn away so he could go back to sleep. But his head wouldn't move—it was attached to a water bottle. Suddenly he was wide awake, remembering. He hastily unscrewed the bottle, ignoring cramped muscles.

He lay in a long shadow cast by the supply dump; the morning sun lined its edges on the ground. He sat up and was immediately blinded. He ducked down and scooted close to the box, dragging the tarp with him.

Squatting in the shadow oasis, feeling the fear of death, he looked to the west. A kilometer away the crawler sat in full sunlight; its airlock door mocked him with an oval-shaped kiss. He sneaked a quick glance around the box, eyes squeezed almost shut: above the distant crater rim loomed a large arc of sun—large enough to kill him in about five minutes.

Water and sleep had done wonders; hungry and weak as he was, O'Hare felt more alive than he had in twenty hours. He didn't want to die. He looked again at the crawler and estimated its distance: seven, maybe eight minutes in his condition. He swallowed without spit.

He drove his brain furiously. There must be a way out of his dilemma! It wasn't fair that he could see his goal, yet know that it was probably death to try for it. An idea formed in the back of his mind, then was lost before he could grasp it. It left him feeling that he was on the verge of a solution, and added to his frustration. And he was ever aware that each minute he stayed

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in safety added another increment to the size of the sun's arc. Fear-sweat pooled at his neck-ring junction.

Finally he couldn't wait any longer. He crouched and worked the cramps out of his legs as best he could. Then, heart pounding, he was up and running clumsily away from the sun.

The heat was intense on the backs of his arms and legs, and got worse as he ran. After 50 meters he knew he'd never make it. But still he ran, and still his mind continued to work. If only he had an umbrella—anything! Or if he'd just had another hour to sleep on it. . . . Great God! Of course!

Cursing himself for a fool of fools, O'Hare braked as fast as he could without falling, turned and began to run back toward the supply dump. The faceplate darkened automatically, but it wasn't nearly enough; he used his left arm to shield his eyes. Now the front of his body felt the sun; it was like taking a shower, the water getting hotter and hotter without relief. He staved off pain by yelling at himself in time to his lumbering strides: I-di-ot! I-di-ot! Fifty meters to go, then twenty, ten, then he was crouching again in the shadow of the supply dump.

Breathing hard, skin tingling, he took stock: probable first-degree burns on elbows, knees, calves, and thighs—and maybe worse on his left forearm. Nothing he couldn't handle for a while. The suit was a little stiff in places; but it would certainly last until he was safely inside the crawler. Safety! He laughed out loud as he reached down and grabbed one edge of the shiny tarp, then raised it up with both hands. ". . . *and all but two of 'em happened because some horse's ass had his head screwed on in the wrong direction. 'Scuse the language. . . .*"

With tarp held overhead and trailing behind like an ugly bridal train, O'Hare strode briskly toward the crawler. ■

IN TIMES TO COME

Given: a starship exploring beyond the frontier, faced with mechanical troubles, forced to put down and try to survive on a barely habitable world.

Then what?

Societies, like individuals and species, must adapt to their environments—and if the environment is really alien, a successful adaptation will be no less so. Donald Kingsbury's *Courtship Rite*, which we begin serializing next month, begins a thousand years *after* that forced landing, and shows us the interwoven lives of several very different people in the complex of cultures which has adapted itself to the harsh planet called Geta.

A lot can change in a thousand years, and Geta provided plenty of impetus for change. For instance, what do you do if the native biology is so lethal that your colonists die off faster than they can breed? With few man-hours to spare for nonessential tasks, knowledge brought from the parent culture is lost rapidly. When you forget how to fix the readers of your solid state libraries, the old knowledge goes even faster, and you begin desperately clinging to the cultivation of those bits of knowledge you most need, and doing things you wouldn't have considered before. And what knowledge do you most need? Biology, of course, both to understand the local system that's decimating your population, and to counter its effects.

The world of *Courtship Rite* is the eventual result, when physical science is finally beginning to be rediscovered. It's a world of real size, scope, and diversity—and the human societies that live there are emphatically *not* just trivial modifications of our own.

A word of warning: a culture with really fundamental differences from your own is likely to be a bit disturbing on first encounter. But I suggest you meet it on its own terms, enjoy it, and see what you can learn from it.

And just wait till you see *us* through *their* eyes!

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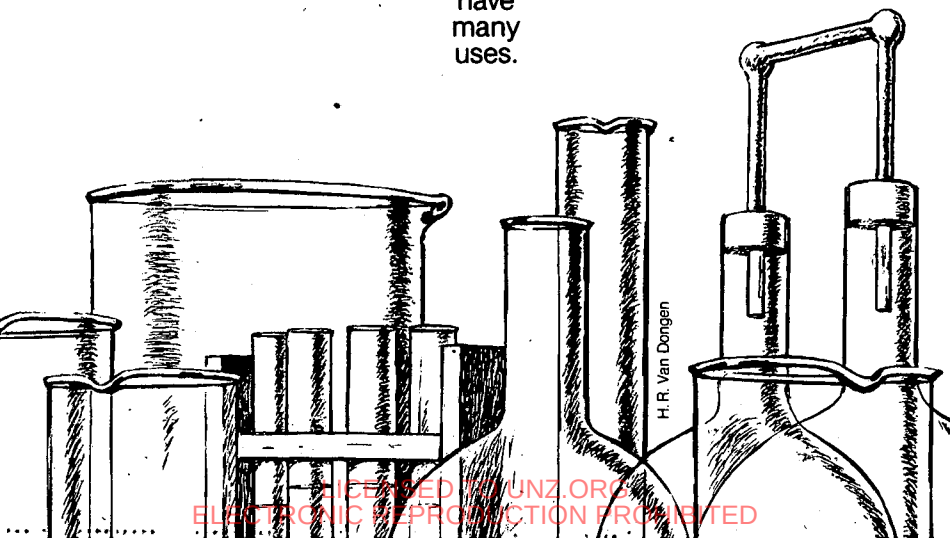
THE CASE OF THE CHEMIST'S CACHE

Thomas R. Dulski

Information can be stored in many forms—and have many uses.



H. R. Van Dongen

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My new job with a chemical firm in King-of-Prussia, Pennsylvania, had taken me away from the frenetic lifestyle of New York City. For nearly a year now I'd reposed in a tranquil setting in suburban Philadelphia with my work at the company laboratory only a short drive away. I was back in the Big Apple on business—the first time in a year—and already I felt that strange but familiar mixture of loathing and affection.

I gave the cabbie the name of my hotel and we roared away from Newark International in a cloud of blue smoke. As we merged with the traffic on the Jersey Turnpike, and the familiar refinery smell began to penetrate the closed windows of the cab, I found myself thinking about the redoubtable Dr. Baker and my years with him in the canyons of stone.

To call Baker an eccentric might be a trifle too generous. Certainly the man's intellectual prowess was beyond question. Yet he chose to march to the beat of that quite different drummer—one whose cadence only he could hear.

Many felt he was as nutty as a chestnut stand, but I had never been prepared to go quite that far. The five years of our association in the firm bearing his name had convinced me that Dr. Oliver W. Baker was as rational as you or I. The *modus vivendi* that he had affected for his lifestyle may have been bizarre by our late-twentieth-century standards, but it satisfied a need in him to delineate himself from his fellow men. Perhaps it was that touch of the poet in all of us—the thing that makes audiences cheer when Princess Leia kisses Luke before he swings her across the abyss to safety. Perhaps—but if Dr. Baker was a romantic at heart, he kept any overt signs of emotionalism out of his demeanor.

As the twin towers of the World Trade Center emerged from the morning fog, I became aware of the taxi's tires whining hypnotically against the road surface. Briefly, I was carried off in a reverie—backward in time, to the moment when I had announced to Dr. Baker that I would be leaving the firm, that I was taking the job with Monash Chemicals near Philadelphia:

The not-quite-gaunt face looks slowly up from the twin-eye-piece microscope. "Yes, of course, Woodside. I've had your last check ready for several days now. Best of luck, old fellow." Then he returns to the specimen under study. Five years of running his errands and washing his test tubes, of being the closest thing to a friend that he had in the world—five years, over like that.

And yet, that *was* Oliver Wendell Baker. Succinct, precise, self-contained. Infuriating.

When I had checked into my hotel room and finished unpacking, I hefted the enormous Manhattan phone directory onto the bed and began flipping idly through its pages. I was dimly aware of my unconscious purpose all the while and soon I found the entry that had drawn me to it:

BAKER ASSOCIATES
SCIENTIFIC INVESTIGATIONS

The address near Lincoln Center was new. Apparently, Baker had been successful enough in the past year to warrant a move to better quarters. When I had worked for him, we had operated out of his second-story flat in the East Village.

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The Eastern Analytical Symposium, which I was in New York to attend, had little to interest me among the sessions scheduled for this morning, so I soon found myself hailing a cab on the street outside the hotel.

The new quarters of my former colleague were in an unassuming brownstone on a residential block. As I approached the address, I noted Baker's dilapidated Volkswagen Beetle parked at the curb. Below the doorbell was a small bronze plate with the same characteristically terse epithet as the phone book ad.

I pressed the buzzer with a mixture of feelings—nostalgia: yes, because, despite it all, I genuinely liked the fellow and had certainly learned a great deal from him; trepidation: yes, that too, because it seemed just possible that Baker might consider my unannounced visit an intrusion and an annoyance, dashing the illusion that we were still friends.

A distant clatter of footfalls down uncarpeted wooden steps and the door swung open.

"Dexter Woodside! How good of you to come!" Baker looked much as I remembered him—tall and thin, dark patches under penetrating blue eyes. He wore the same Harris tweed smoking jacket as always. He spoke through clenched teeth which held a child's plastic pipe, the bowl of which was surmounted by an array of soap bubbles.

"I was in town . . ." I began.

"Quite so. I've been expecting you. Certainly there was nothing that would hold your interest in the symposia being held this morning." He opened the oak door wider and motioned me inside.

"But how did you know I'd be attending the E.A.S. this year?" I asked, playing the foil, as always.

"Marchand's paper tomorrow afternoon, of course." Baker closed the door and tapped his teeth with the stem of the bubble pipe. "Graphite furnace atomic absorption with the L'vov platform—one of your special interests, I recall. Of course there is the special attraction of Gotham—it's in your blood, Woodside. It will draw you back here from time to time."

I unbuttoned my raincoat, noting that Baker still kept his quarters uncomfortably warm. "Well, at any rate, Baker, it's good to see you again." I glanced about the neatly appointed foyer. "You seem to have done quite well for yourself in the last year."

"Mmm, the concierge at the old place was getting a bit tiresome. And as it happens, some remunerations from an interesting case involving some Arabian oil companies provided the wherewithal to move. But do come upstairs and I'll show you the laboratory."

"Have you taken on a new associate?" I asked, as we mounted the wooden stairs. For five years Baker Associates had consisted of just the two of us.

"Not yet. I've interviewed a number of applicants—recent graduates, mostly, and all with an inflated view of their own worth."

That sounded like the old Baker. I could readily envision those interviews—the bewildered applicants agog, perhaps wondering if they were being made the butt of some elaborate fraternity prank.

At the top of the stairs was a room

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furnished in chrome and glass. White cushioned sofas and several hanging baskets of spider fern. Glass-topped tables, massive crystal ashtrays, several tastefully framed Klee prints on the walls. I had to admit that it startled me.

There was a twinkle in Baker's eye. "Not exactly what you expected, eh, Woodside?"

I looked about me at the airy spaciousness and the bright glitter. "Good God, Baker, you've gone contemporary!"

"Not quite, old boy. But you see, someone convinced me to hire an interior decorator. I was never the sort to get involved with furnishings and such." He surveyed his new domain with resigned detachment. "It grows on you, they tell me. Cost a pretty penny too, I might add."

"I can imagine!"

Baker hurried me through this sparkling wonderland toward a door on the far wall. "The laboratory is through here," he explained.

Now I felt that we had returned to Baker's natural environment. The old acid-stained benchtop, apparently ripped bodily out of that old village flat and transported uptown. Wall cabinets full of reagents, Zeiss binocular microscope, Perkin-Elmer infra-red spectrophotometer, a battered old gas chromatograph. The sink was full of unwashed labware—he'd apparently missed my services in that regard, at least, I noted.

"Well," I said, "this all looks very familiar."

Baker placed his bubble pipe carefully in a bowl of soapy water. "A few new touches, Woodside. I've found this little calculating device quite useful."

It was a programmable desktop calculator. Apparently equipped with interactive graphics, the screen displayed a collection of spheres joined together at oblique plane surfaces.

"Lately," Baker said, "I've been using it to study the geometry of soap bubbles. Specifically, the rules of Plateau . . ."

Since I had resolved not to mention the bubble pipe until he broached the subject, I felt somewhat relieved that this new eccentricity was grounded in science. "I wasn't aware that the Greeks studied soap bubbles," I said.

"Not Plato, Woodside, Pla*teau*. Joseph A.F. Plateau, a nineteenth-century Belgian physicist who first formulated the geometric rules obeyed when soap bubbles are joined. It's quite fascinating, really. . . ."

I could sense one of Baker's verbal dissertations in the offing, complete with the usual polemics against the orthodox view.

He did, in fact, begin: "Contrary to popular belief . . ." then paused abruptly. "Mmm, sorry Woodside, but it appears my clients are a bit early this morning."

"Clients?"

"The slam of a car door out in the street. A European-made sports car, I would guess."

"I didn't hear . . ." I began, but was interrupted by the sound of his doorbell.

He ushered me back into the living room/office. "Please stay and meet these people, Woodside. You may find it interesting."

I looked at my watch, self-con-

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sciously, fully aware that I had nothing better to do with the remainder of the morning. Still, I fought the uneasy feeling that I should leave now before I reentangled myself in the affairs of Oliver Wendell Baker.

"There's a good fellow. Just sit down in here and I'll show them up." Baker descended the steps and I heard him exchange greetings at the door.

I was still squirming uncomfortably on the white sofa when a stunning-looking woman walked in the door. I leaped to my feet instinctively, rather like a shocked rat. She was followed into the room by a tassel-haired young man in a wrinkled sport coat.

Baker appeared behind them in the doorway. "May I introduce my former associate, Mr. Dexter Woodside. Miss Alicia Nogatz. Mr. Jeremy McCluhan."

I extended my hand rather numbly at the young woman, who seemed to be used to having men stare at her. Finally, I remembered to shake hands with the young man as well. He seemed a bit distracted, or, perhaps, just a little vague.

"Please sit down," Baker said, "and we'll discuss your problem. Mr. Woodside is in my confidence and I'll vouch for his discretion."

Miss Nogatz took a seat—somewhat spectacularly—directly opposite the sofa, where Mr. McCluhan plopped himself down beside me. Baker, for the moment, chose to remain standing.

"Now then," Baker said, "if you'll outline in detail exactly what sort of service you require."

There was a moment of silence that made me wonder just which of these two was the principal here. Finally, Miss Nogatz spoke: "Well, go ahead, Jeremy dear. The man asked you a question."

The young man rubbed his hair, staring off into a far corner of the room. "Yeah, sure. Well, it's like this . . . My uncle left a will. He was a chemistry prof over at the university. . . ."

"Then you are the nephew of the late Dr. Jason McCluhan?" Baker interrupted. "I am, of course, familiar with his work on the structure of terpene compounds."

"Yeah," the young man said. "He won a prize for that. . . ."

"The *Nobel* Prize," Miss Nogatz added.

"Quite so," Baker said. "A brilliant piece of work back in the last decade. He developed a completely new series of synthetic routes to the formation of complex isoprenoids, then proved their identity with the components of naturally occuring essential oils."

The young man shuffled his feet nervously.

"Dr. Baker," Miss Nogatz said, "Jeremy has come to you because his uncle's estate rightfully belongs to him as the only surviving relative. An unreasonable provision in the will has placed the money in escrow."

Baker nodded solemnly. "And do you have a copy of the will with you?"

McCluhan fumbled in several pockets of his coat, finally producing a wrinkled sheet of paper which he handed over.

Baker paced in front of us, reading the document without comment. When he had finished, he passed the paper to me.

It was remarkably concise:

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To whom it may concern,

I, Jason William McCluhan, being of sound mind and body, do bequeath all my earthly possessions to my nephew, Jeremy Robert McCluhan, only son of my dear departed brother, on the sole and binding provision that he locate and present to my executors within thirty days of my demise the full text of my final message to him, which includes the location of the greater portion of my wealth. Since my nephew has chosen to study the field of chemistry, a discipline to which I have devoted my life, I have left my last message in the laboratory in my home.

Recorded this day,
April 9, 1983
Jason W. McCluhan

I folded the sheet as neatly as possible in light of its wrinkled state and returned it to the young man. "You've examined his papers and effects, I take it?"

"Oh, yeah. Nothing but a lot of formulas and stuff. Alicia and I have been through that junk a hundred times in the last two weeks."

Miss Nogatz crossed her legs, getting my full attention. "Jeremy's uncle was a bit of an eccentric—as brilliant men often are. He apparently felt the need to present the inheritance in the form of a scientific puzzle of some sort. The message is undoubtedly there in some form or other, but we . . . or rather, Jeremy, hasn't succeeded in unraveling it. And the time limit is running out."

Baker, who had continued to pace up to now, seated himself on a marshmallow-shaped ottoman. "In the event of your failure to fulfill the conditions of the will, I assume that the money would become state's property."

"The part that's known to the lawyers, anyway," McCluhan said.

"And what does that consist of?"

McCluhan shrugged. "The house in Queens, the summer house in Cape May, the Mercedes and the Bentley . . ."

Baker rubbed his upper lip. "I am a little surprised that a dedicated academic would have taken the time to accumulate such wealth. And, as the will indicates, the major portion of the estate remains hidden at this point."

McCluhan scratched at his scrambled hair. "Unc came back from Stockholm, I guess it was, with a bundle . . . the prize money, you know . . . back in the early seventies. He invested in some Atlantic City real estate that turned into a gold mine when the casinos moved in." The young man shrugged. "Dumb luck, really."

"I take it, then," Baker said, "that we are talking about several millions of dollars."

"Ten, twenty, I'm guessing," McCluhan said.

Miss Nogatz, whom I noticed was growing agitated, broke in at this point. "I don't see that the financial end is really of concern here. The service we require simply involves finding and . . . decoding, or whatever, the message that Jeremy's uncle left for him. What is your standard fee, Dr. Baker?"

Baker looked at her, calmly. "May I ask, Miss Nogatz, what is your relationship with Mr. McCluhan?"

Temper flared behind beautiful brown

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eyes. Then she caught herself and smiled coyly. "Why, Jeremy and I are to be married next month," she said.

Baker displayed no sign of what he might be thinking. "Are you a chemistry student, Mr. McCluhan?"

"Naw, not any more," McCluhan said. "I switched majors a couple of times in my junior year, then sort of dropped out. Despite what Unc might have thought, I never was much interested . . ."

"As the only surviving heir," Miss Nogatz interrupted, "the estate rightfully belongs to Jeremy, regardless of whether he's chosen to be a chemist or not."

"Mmm, yes. Your point is well taken, Miss Nogatz." Baker paused a moment, lost in thought. "My fee will be seventy-five thousand, payable upon successful completion of the contract. If I fail to solve this problem within the allotted time—which I calculate to be twelve days—you will only be liable for my expenses, which I will submit to you in itemized form."

Alicia Nogatz started to say something, but McCluhan spoke up first.

"You got yourself a deal, Doc," he said.

After agreeing to meet Baker at the late Jason McCluhan's home the following day, the couple departed hurriedly, leaving the two of us in a pensive mood.

"Did you know Jason McCluhan?" I asked, finally.

Baker had resumed his pacing and he stopped now, his thin features reflected in the glass of one of the framed prints on the wall. "Slightly," he said. "I consulted with him on the analysis of a perfume sample. You must remember the Tryst cologne case?"

Indeed I did—a tangled affair involving multiple charges of industrial espionage among three cosmetics producers. "That's right," I said, "I recall now that Dr. McCluhan confirmed your gas chromatographic results."

"A brilliant man," Baker confirmed, "quite at home in both analytical and synthetic chemistry. He had a peculiarly oblique approach to a problem that often led to remarkable discoveries."

"Was he the sort to leave this kind of a puzzle for his nephew?"

"Just so. And if I'm any judge of character, its solution will require some new way of thinking."

I got up and stretched a bit. "And what do you make of your young clients?"

Baker started pacing again, one hand in his jacket pocket, the other behind his back. "I would surmise," he said, "that young Jeremy is a gambler, while Miss Nogatz is a former chorus girl from one of the casino shows at Atlantic City."

"Oh, really? What led you to that?"

"They arrived in a late-model Jaguar sedan, suggesting money and a flair for spending it. No mention was made of any employment since he dropped out of the university, so we may assume that Jeremy did not come by the car by the sweat of his brow. The admittedly dishveled sport coat that he wore was new and of a fine cut from Italian fabric —obviously, expensive—from an exclusive haberdasher in London. Their only American outlet is in one of the casino hotels in Atlantic City.

"Moreover," Baker said, "Jeremy's

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disarrayed appearance and distracted aspect are suggestive of keeping late hours—such as at the gaming tables. When he sat down, there was a distinct click of two uncashed and forgotten gambling chips in his right coat pocket. Also, most apparently, the boot of the Jaguar bore the emblem of an Atlantic City dealership."

"Amazing, Baker," I said, despite myself. "And what about Miss Nogatz?"

"We can assume that Alicia Nogatz is her real name, to which she recently returned when she met Jeremy. For the moment, her stage name is irrelevant, but it is reasonably certain that she performed on the stage under another identity. Her graceful movements and the tone of her musculature are the result of years of dance practice and rehearsals. Her makeup, while subdued, was applied with the *savoir-faire* of someone used to applying stage makeup. Her clothes, too, are from a casino hotel shop—an outlet of a Paris fashion salon. Finally, from the timbre of her voice, I would rule out any vocal training—so that she is, obviously, not a singer. Her accent and phrasing place her origins in the midwest—Illinois, possibly."

It all sounded plausible, of course, and I couldn't help but wonder at Baker's deductive powers, but I began to feel once again like a minor character in a Victorian melodrama. I looked at my watch. It was almost noon.

I began to look for a graceful way of bowing out of Baker's story-line. "Well," I said, "you certainly have an interesting case here."

Baker noticed me donning my raincoat and stopped pacing. "Tell me, Woodside, what do you make of Miss Nogatz?"

"She seems to be a gold-digger out for a share of the inheritance, don't you agree?"

"I concur with Sir Isaac Newton's approach: *Hypotheses non fingo:* I do not frame hypotheses. However, you may be right, in which case there is an ethical question involved in taking the case. As a respected colleague, I believe that I owe Jason McCluhan some measure of regard for his wishes. While he may have overestimated his nephew's interest in chemistry, I believe that he truly intended the money for Jeremy." Baker rubbed his upper lip. "Perhaps there is a way to determine Miss Nogatz's true motives. . . ."

"A sticky situation, to be sure," I said, taking a step toward the door. "I wish you luck . . ."

Baker snapped out of his reverie. "It's precisely in that area that I thought you could render me an enormous service, Woodside."

Suddenly, I felt the jaws of a steel trap yawning over me. "Really, Baker, I must be going. There's a paper in one of the symposia this afternoon that . . ."

"What! Hodgkin's report on Zeeman effect atomic absorption? That's rehash, Woodside, I'm sure you're aware of it." He looked away, studying one of the spider ferns. "Of course, if you're all that set on not getting involved . . ."

He really is a lonely *lunatic,* I thought. Then I caught myself. *Oh, no you don't, Baker. I'm a scientist in my own right. I've got a career with another firm.* "I don't think I'll be able to . . ."

"Of course," Baker interjected, "it

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would only involve taking Miss Nogatz out for a drink . . ."

"Miss Nogatz?"

"For a drink. I thought, perhaps, you could establish some kind of rapport with her. Strictly on a professional basis, of course."

"Of course."

"To help establish her true motives in this matter."

"Well," I said, "I wouldn't mind helping out to that extent. . . ."

Baker wheeled around, almost smiling. He produced a slip of paper from his lapel pocket. "Here is the phone number of her hotel. Young Jeremy is staying with friends at a fraternity house, I gathered."

I took the slip of paper and bid my farewells to Baker. It wasn't until I was on the street, walking toward the cab stand at Lincoln Center, that I realized that the jaws of the trap had already closed about me.

When I returned to my hotel room, I began to realize that Miss Nogatz might not be at all receptive to a social meeting without some convincing fabrication on my part. When she answered her phone, I explained that, despite our introduction at Baker's office, I was, in reality, an undercover agent for the CIA. I told her that my office was investigating certain suspicious aspects of Jason McCluhán's research and that I needed to talk with her privately. To my amazement, she agreed at once and we set up a meeting for the early evening hour at a cocktail lounge near her hotel.

I found her at a booth in the back of the room. She was clutching a sequined handbag and looking somewhat nervous. When I greeted her, she started. "Thank goodness you've come," she said. "I don't think I could have taken much more of this."

It seemed a most curious reaction. "Oh, really?" I said.

Her eyes scanned the room. "You weren't followed, were you?"

"Ah, no, of course not."

"That's right, of course. You fellows are pros." She looked me over carefully. "I've got to hand it to them. They certainly pick people you would never suspect."

I had never imagined that my subterfuge would be accepted so readily. "In this business," I said, "it pays to be able to blend into the woodwork . . . ah, so to speak."

"I understand," she said. "But listen, we may not have much time. I never knew that Max was a Russian agent. You've got to believe me, Mr. Woodside!"

"Max?"

"The choreographer at the Dolphin Casino. You must know Max is behind all this." Her lips trembled just a bit, then she regained some composure. "Oh, I know, I'm not an angel in this whole business. But I thought it was just a simple scam—you know, take that poor shnook for part of his inheritance. I thought I was in love with Max. We were going to meet in Mexico. Oh, how he led me on!" Her fingernails dug deeper into the handbag.

"Miss Nogatz, I . . ." But she touched my hand to silence me. The waitress had appeared to take our drink order.

When she had gone, Miss Nogatz resumed her impassioned tale. "By the

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time I found out that there were Russian spies involved in this thing—that Max was one of them—I was in too deep. Max threatened to spill the beans to that sap, Jeremy, if I backed out. When I told him I didn't care, he threatened to kill me! That —!"

It was a word that I had heard on a number of occasions, but never from an individual who looked even remotely like Miss Nogatz.

"That's why I'm so relieved to tell you all this," she said. "I want no part of this. I want to go back to Urbana and marry some jerk who owns a hardware store. I'm tired of pretending and I'm sick of being scared."

To say that the preceding narrative left me startled and nonplussed would be to understate the case considerably. And yet I found myself speaking the part in my assumed role, almost unconsciously.

"Did Max tell you what the Russians' interest in this affair involves?" I asked, somewhat vacantly.

"Only that it's something to do with the message that Jason McCluhan left for Jeremy. I don't know . . ." She fell silent as the waitress set down two sherries on soggy napkins.

". . . I don't know if even Max has been told by the higher-ups in the KGB exactly why that message is so important. It was Max who told me to plant the bug in Jeremy's ear about coming to Dr. Baker with the problem." She started to reach for her glass, then looked up at me with a new thought. "Say, this Baker—he's all right, isn't he? I mean, he's not one of *them?*"

I took a sip of sherry, noticing that my hand was shaking. "He's been checked out," I said in my new-found rôle. "He's loyal."

She downed her glass in a most unladylike manner and smiled for the first time. "I can't tell you how relieved I am," she said. "I mean, now that you fellows are in on this, I just know everything's going to work out fine."

"Most remarkable," Baker said, pouring me a spot of brandy to help steady my nerves.

"So after leaving Miss Nogatz, I came straight over here. Really, Baker, I think we should contact the authorities on this immediately!"

Baker passed me the snifter, somewhat absently. "Evidently, Jason McCluhan had hit upon some synthetic or analytical process of strategic value. We must surmise that he was unaware of its military or diplomatic implications, or else he wouldn't have employed it in something so frivolous as a puzzle for his nephew."

I took a swallow from the snifter, holding the bowl with both hands. "Perhaps," I said, "the CIA has a local phone number. We could . . ."

"In due time, Woodside. What interests me at the moment is the puzzle itself. While you were chatting with Miss Nogatz, I took a spin down to the New York Public Library and surveyed Jason McCluhan's entries in the last few editions of *Chemical Abstracts*."

"Any clues as to what this is all about?"

"In the last year or two before his death, Dr. McCluhan's research interests took a new turn. You recall that his Nobel Prize-winning work was concerned with the synthesis of naturally

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occurring terpenes—the constituents of lemon oil, pine needle oil, and so on. Well, the naturally occurring essential oils are very complex mixtures, and while it is possible to synthesize the individual terpene compounds by McCluhan's routes and others, the total synthesis of the entire naturally occurring mixture is elusively complex."

"Isn't it cheaper to just extract the naturally occurring oil? For commercial purposes, I mean."

"Quite so. For centuries, the essences of natural products have been extracted with steam or solvents for use in perfumes, soaps, foods, and a host of other products. And such processes are still thriving commercially. In this century synthetic fragrances and flavors—often compounds with no correlate in nature—have been produced on a large commercial scale. These are in direct competition with the natural product extracts. The economic aspects are complicated by charges that the artificial essences may have harmful effects.

"Evidently, Jason McCluhan felt that it was possible to select reactants and conditions in the laboratory to mimic the complex biochemistry that produces the intricate mixtures of compounds in nature." Baker looked at me and there was genuine admiration in his voice. "Think of it, Woodside! This is a new order of synthetic chemistry. Up to this point, the chemist planned his work to result in the formation of one compound and one only. Patiently, he purifies and isolates, discarding everything but the one substance sought. McCluhan now, proposed a polysynthesis of hundreds of compounds simultaneously in one flask!"

The brandy had made the room seem insufferably warm, and I set the unfinished glass down. "Was there any indication in the literature that McCluhan had actually succeeded in this polysynthesis, as you called it?"

"Only with straight-chain hydrocarbons, as far as I was able to discern. At the time of his death, he was trying to extend the synthesis to mixtures of the terpenes with which he had worked for so many years."

"Getting back to the matter at hand, Baker. Don't you think . . ."

"The point, Woodside, is that I believe that McCluhan's recent research is somehow tied in with the inheritance puzzle and the Russians' interest in it." He opened a closet and removed his coat and mine. "We've speculated long enough. I think it's time to take a look at McCluhan's laboratory first hand."

"I thought that was set up for tomorrow."

"Indeed. But your conversation with Miss Nogatz suggests a certain urgency. And besides, it's just possible that we may do somewhat better without the company of Alicia and Jeremy."

I put on my coat reluctantly. "Breaking and entering, Baker?"

"Just a little clandestine investigation. You don't mind driving, do you?"

"Baker, I really think we should contact the authorities on this."

"The hour is late and the matter is pressing," he said, ushering me toward the stairs. "Quick, Woodside, the Beetle!"

I parked the Volkswagen a block away from the Queens address that Jeremy had given to Baker. Even so, I

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feared that its cantankerous and long-neglected engine would wake the neighborhood.

The house of Jason McCluhan was a red-brick two-story surrounded by a small plot of grass and shrubs. We found our way stealthily to a side door that seemed to lead directly down to the basement. Baker produced a lined case of wire lock picks and let us in with a professional flourish.

The steps we descended were of crumbling cement and there was a damp smell of mildew. "Easy there!" Baker said, and tried to grab my arm. But it was to no avail. I found myself tumbling downward into the darkness.

In seconds the sharp beam of Baker's flashlight was shining in my eyes. "Are you injured, old fellow?"

I didn't seem to be and said as much. The beam flicked out, and then suddenly the room we were in was ablaze with light, as Baker found the wall switch.

I was sprawled on the vinyl floor of a fully equipped chemical laboratory. Fume hoods lined with rotary evaporators and distillation columns, instrumentation of all sorts—infrared and UV spectrophotometers, gas and liquid chromatographs, even a large nuclear magnetic resonance spectrometer over in one corner.

Baker helped me to my feet. "Apparently," he said, "not all of Jason McCluhan's Nobel Prize money was spent on Atlantic City real estate."

From an upright perspective, the room was even more impressive. I noticed a minicomputer complete with dual floppy-disk drives and an interface with ribbon cables snaking away from it to the various instruments around the room.

"It looks like a couple of million was spent right here," I agreed.

Baker was examining a large vial with an amber-colored liquid in it. "We can reasonably assume that Jeremy and Alicia's assessment that the written notes here are no help is correct."

"How is that?" I said, retrieving a button from the floor that had popped off in my fall. "I shouldn't think that you could trust their judgment."

"Perhaps not," Baker said, studying the labels on a rack of test tubes, "but I think I know something about the way Jason McCluhan's mind functioned. A simple cryptogram among his research notes doesn't strike me as the kind of legacy he would leave."

I began wandering among the benches and equipment on my own, feeling a twinge of envy at the impressive facilities. Even the lab at Monash Chemicals paled by comparison. A differential pulse polarograph . . . a thermogravimetric balance . . . why, against the far wall I distinguished the bulky outline of a quadrupole mass spectrograph. It was like attending an instrument show at one of the large scientific conventions! There is a small child in many scientists—usually well hidden—a child that delights in pushing buttons and turning knobs. I confess that there is such a tyke in me, and right now he was romping merrily through the aisles of a toy store.

If Baker was impressed at the equipment, he gave no sign. Across the room I noticed that he was still engaged in an examination of the glassware and their contents.

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Trying to be of some help, I looked over some of the strip chart tracings from a few of the instruments. No clue suggested itself in the inked squiggles, though I had no idea what I should have hoped to find there.

Coming upon a cluttered desk, and despite Baker's admonition, I leafed through several notebooks. The pages were full of structural formulas and kinetic data, most of it rather arcane, at least to me. A pile of rolled chart papers from a gas chromatograph was heaped on top of a massive stack of computer print-out. Pencils, erasers, pocket calculator, an apple in the early stages of decay—nothing on the desk seemed in any way extraordinary. The contents of the drawers were, likewise, mundane.

I got up and strolled to a lab sink where a foul-smelling chemical had evidently been dumped some time ago. Whatever it was had never been flushed down with water and had settled in the elbow trap under the drain. I was about to run the tap to rid the room of the odor, when Baker called out:

"Woodside! Look at this."

Baker had returned to the vial of amber-colored liquid that had caught his attention when we first entered the room. "This may be the answer, Woodside," he said, turning the vial so that its contents caught the light.

"What leads you to that?"

"Did you notice that large glass reaction vessel in the hood over there?"

"Mmm, yes, I suppose so. Is there some significance?"

"I believe that is where Professor McCluhan performed his polysynthesis experiments." Baker gestured toward the apparatus. It was a plumber's nightmare of tubes, condensers, mechanical stirrers, and heating mantels. "By varying the reactants and conditions in that apparatus, I believe that he was able to synthesize very complex mixtures of compounds in precise ratios of concentration."

"Well, we already knew that. As you pointed out in the office . . ."

"Note the test number marked with a felt-tip pen on the side of the reaction vessel."

My eyesight is not what it once was. I took a few steps toward the hood. "JRM 092," I read. "I see nothing in that except a bit of conceit. Marking his test data with his own initials, I mean."

Baker looked at me disapprovingly. "Those are not Jason McCluhan's initials," he said.

"You mean . . ."

"Precisely, Woodside. They are the initials of Jeremy *Robert* McCluhan. And here in my hand is the mixture of organic compounds that is the result of that test run, the vial marked with the same test code."

Once again I sensed within myself that combination of admiration and frustration. Frustration because, as long as I had anything to do with Dr. Baker, my part in his story-line was a series of uncompleted sentences. I said: "But how can a vial of liquid . . ."

"I found the answer to that, as well," Baker said. "And tomorrow Jeremy shall hear his uncle's last message."

The following twelve hours passed with interminable slowness, much of which time I spent tossing fitfully on my hotel room mattress, pursued by visions of sinister-looking foreign agents out of a James Bond movie. Time and

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again during the night I resolved to catch a morning flight back to Philadelphia, extricating myself from further involvement in the strange scenario. But whether it was a genuine desire to see Baker safely through whatever denouement he had planned, or whether it was a previously undiscovered streak of extreme stupidity, I found myself once again in Professor McCluhan's basement laboratory in the company of Baker, Alicia, and Jeremy.

Baker, never one to feign ignorance, started the proceedings with a full description of our clandestine entry the night before.

Jeremy, apparently unaccustomed to the early-morning hour, yawned broadly. "What was the rush, Doc?" he said. "I would have given you the key."

Baker was unperturbed. "There is some reason to believe that more is involved here than just your uncle's inheritance." At this, Miss Nogatz's eyes widened, but she remained silent.

"What do you mean, there's more involved?" Jeremy asked, stifling a second yawn.

"I prefer to say no more at the present," Baker told him. "Just be it said that your uncle apparently didn't fully appreciate the implications of the . . . process by which he left his message for you."

Miss Nogatz, hiding a nervous tremor in her voice, spoke up: "Then you've found the message and decoded it."

"Yes," Baker said, leading us over to the lab bench where the microprocessor-controlled gas chromatograph sat, "it was really quite simple to decode once I realized that the message was contained in a liquid mixture that Jason McCluhan synthesized."

"A liquid." Jeremy said. "Boy, leave it to Unc!"

Baker held up the vial marked with Jeremy's initials. "As you must know, your uncle developed some remarkable chemical syntheses. Recently, he became able to synthesize hundreds of related compounds simultaneously and in exact molar ratios . . ."

"Look, Doc, I told you that I dropped out of chemistry some time ago. Put things in words of one syllable, if you've got to explain the whole works."

Baker leaned an elbow on the gas chromatograph, regarding the glass vial in his hand. "Fortunately, it will not be necessary to describe in detail the chemical and mathematical basis of your uncle's technique. In its simplest terms, however, it involves some unique synthetic pathways employing a serial catalysis. The exact reaction conditions are calculated by means of a rather involved multivariate analysis using the calculus of tensors."

Young McCluhan scratched his tousled mop, but protested no further.

Baker now directed their attention to the gas chromatograph. "This instrument," he said, "was the means by which your uncle intended his message to be deciphered. Note that it was left in a stand-by mode with a set of instructions in its small computer memory." Baker punched a "list" button on the typewriter keyboard attached to the otherwise almost featureless metal box. Immediately, the thermal printer above the keys began to whirr back and forth across the paper, printing a long list of symbols and numbers. "These," Baker

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told them, "are instructions for this instrument. Parameters are being set as they are printed. It's the automated equivalent of precisely setting several dozen dials and gauges."

Baker regarded the growing list of parameters silently for a few seconds. "It will take a short while for the instrument to stabilize. During that time, perhaps I should explain what a gas chromatograph . . ."

"Yeah," Jeremy said, "I guess you'd better."

"It's an amazingly simple analytical technique for analyzing complex mixtures of organic compounds. The first commercial instruments became available in the 1950s, and today, as you can see, they have reached a considerable level of sophistication. A small quantity of the liquid to be analyzed is injected by means of a small syringe into a flowing gas stream. It is vaporized in the heated injection port and the vapor is carried by the gas stream into a coiled tube in a heated oven. The tube contains a granular material—the inert substrate—which is coated with a high boiling substance, often a silicone oil, called the stationary phase. The sample vapor interacts with the stationary phase by physical adsorption. The lighter, lower boiling components of the sample are less strongly adsorbed and are carried through by the gas stream relatively unhindered. Intermediate range boilers are somewhat more strongly adsorbed and take longer to pass through, while the highest boiling compounds are adsorbed very strongly and elute last. In this way a mixture is separated into its components much as it would be by fractional distillation, but much more efficiently."

As Baker paused for a breath, I observed that neither Jeremy nor Miss Nogatz appeared enraptured with interest. Jeremy continued to display his distracted air, while Miss Nogatz showed signs of growing agitation. I, too, wished that Baker would get on with matters, haunted as I was by the imaginings of a sleepless night.

Oblivious, evidently, to all this, Baker continued: "As the components of the sample emerge from the coiled tube they are carried by the gas stream into any of several types of detector—thermal conductivity, flame ionization, electron capture, photoionization, coulometric, and flame photometric are among the more common types. These vary greatly in both their sensitivity and selectivity for various compounds. The signal from the detector is amplified and displayed as a series of peaks on a strip-chart recorder. Each peak corresponds to a component of the original sample mixture. Its height and its area are both proportional to the quantity of that particular component in the sample."

Baker patted the keyboard unit, where a "ready" light now glowed dimly. "Modern versions, such as this, have substituted a thermal printer for the conventional strip-chart. The same dot-matrix that creates alphanumeric characters also draws the peaks of the chromatogram . . ."

"Baker," I said, my unease growing, "perhaps you should inject the sample."

"Just so, Woodside. I was about to."

With practiced motions Baker inserted a microliter syringe through the rubber septum that sealed the vial, withdrawing a sample of the solution that

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Jason McCluhan had synthesized. He injected the liquid in a port on the top of the metal box and touched a control on the keyboard.

Immediately, "inject" was printed on the paper, followed by a vertical line that lengthened as the paper began to advance at a steady rate. Soon the line took an abrupt jump to the right and returned immediately to its former position. In a moment the line took another jump, only half as far, creating a second peak, then a third, also half the size of the original. There was a space of, perhaps, three seconds while the baseline remained straight, then another half-sized peak, followed by another space. Small peak, large peak, space, small peak, large peak, small peak, space . . .

"I don't get it," Jeremy said, peering at the developing chromatogram.

"Is that the code?" Miss Nogatz asked, the tremor still in her voice.

"Exactly," Baker said. "International Morse Code. The large peaks stand for dashes and the small peaks for dots; the spaces between groups of peaks are used to separate letters. Just imagine the calculations involved in selecting the compounds for synthesis so that their boiling points and molar concentrations would produce . . ."

"What does it say?" Jeremy interrupted.

Baker took a slip of paper from his inside coat pocket. "Last night Woodside and I ran out the entire chromatogram and decoded the message. Fortunately, I am familiar with Morse code, so that the process proceeded quickly." Baker began to read: "Dear Jeremy Stop Congratulations the money is yours Stop Numbered Swiss accounts are listed in Beilstein page nine seven four Stop Good luck Stop"

"Beilstein?" Jeremy said. "Is that a book?"

"A classic text on organic chemistry. The book was in your uncle's office at the university. Last night I stopped by there and picked it up for you." Baker produced the massive tome from behind the chromatograph and opened it to the page, where a series of numbers was pencilled in the margin.

"Everybody will please not move!"

My reaction at this point is difficult to recall with any clarity. I know that I whirled around instinctively at the sound of the strange voice, to find myself staring down the muzzles of three massive handguns that seemed to be fitted with silencers. The guns were in the hands of three ominous-looking men in trenchcoats standing in the doorway of the basement laboratory.

For just a moment I decided that I had, after all, nodded off to sleep in my hotel room. But the comforting thought quickly vanished.

"Max!" Miss Nogatz said, "you—!" There was that word again.

One of the men—the one who had spoken—took a few steps into the room. "Alicia, my sweet, such harsh words for your lover!"

Jeremy squinted at the three men, as if trying to resolve the apparition. He didn't seem to be particularly frightened. Perhaps he imagined this to be some sort of fraternity joke.

Miss Nogatz shot me a glance full of meaning. Obviously, she still believed that I was a CIA agent and she expected me to spring into some sort of heroic action at any moment. "Max," she said

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to the man with the gun, "I told you that I wanted no part in this spy stuff!"

"But, my darling," Max said, "you *did* carry through with our little drama, didn't you? The good Doctor Baker, here, discovered for us that Jason McCluhan had learned a new form of cryptography."

I felt my legs starting to go rubbery on me and steadied myself by grasping the edge of a lab bench. The two men at the door seemed to take this poorly. They hurried in and one of them pointed his gun only inches from the tip of my nose.

"You will please make no sudden movements," Max said, calmly.

Baker closed the huge chemistry text with a slam, directing their attention and their guns toward him. "I take it, then," he said, before anyone else could speak, "that your government has been employing a process similar to Dr. McCluhan's for some time?"

Max glared at him. "*That* is not anyone's concern here!"

"I would imagine," Baker said, "that keeping track of the movements of the United States nuclear submarine fleet has been a formidable task. Particularly since radio communications between your fishing trawlers and your naval vessels are so easily intercepted. And *our* side still has the better computers for cracking codes. . . ."

"That's enough!" Max said.

"On the other hand," Baker continued, "no one pays any regard to small oil slicks in the shipping lanes. Oil slicks dumped by the trawlers and sampled by your submarines at periscope depth. Oil slicks composed of the same hydrocarbon compounds as any others that spot the seas these days, but with some, shall we say, atypical concentration ratios. . . ."

Max's anger cooled to professional calm. "Very good, Dr. Baker. You have worked out the details of one of the Kremlin's most carefully guarded secrets."

"I take it," Baker said, matching his calm, "that a Soviet chemist some time ago worked out the same mathematical and chemical process that Jason McCluhan recently hit upon. Chemical equipment and computers were installed in your trawlers and other merchant vessels, while your nuclear submarine fleet was outfitted with gas chromatographs. The passage of messages this way helps to tip the strategic balance slightly in your favor. When Jason McCluhan began publishing his recent research in the open literature, you correctly assumed that he was on the verge of discovering your cryptographic process."

Max's smile was not pleasant. "Correct, Doctor. And my mission is to destroy all evidence of his work. That evidence now includes the four of you. . . ."

Baker rubbed his upper lip. "Mmm, yes. It would be rather awkward . . ." With that, Baker threw the massive Beilstein book directly at Max's gun-hand. A muffled report and a grunt from Max as the gun went off harmlessly. Alicia reacted instantly, grabbing a large porcelain Buchner funnel and shattering it over the head of one of the other men. I saw my chance then and threw a flying block at the remaining man. We toppled together and I hit the vinyl floor hard.

"Everybody freeze!"

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I looked up from the floor to see three more men standing in the doorway holding guns.

"Preston, FBI," one of them said.

It was late afternoon of the following day. What with the endless interviews and depositions at the FBI offices, I hadn't attended any of the symposia at the analytical conference. I checked out of my hotel and took a cab to Baker's quarters for a final farewell on my way to Newark Airport.

I found him, as I might have expected, blowing soap bubbles and comparing his creations to the mathematically generated figures on his calculator screen.

"Woodside," he said, after we had exchanged amenities, "I may soon be involved in a case related to the physics of thin-films." He gestured toward the screen with the stem of the plastic pipe. "I noted a certain interest on your part. . ."

"Really, Baker," I said, very firmly, "I just stopped by to say good-by. My plane leaves for Philadelphia in less than an hour."

"So be it," he said, snapping off the screen. "Well, in any event our present collaboration seems to have come to a satisfactory conclusion. Jeremy has his money and the Soviet's oil-spill cryptography seems to have been thwarted."

"And what of Miss Nogatz?" I asked. "Her future seems a bit uncertain."

Baker placed the pipe in his teeth and blew a large bubble reflectively. "I'm afraid Jeremy lost interest in her, when the full events of yesterday morning finally sunk in with him. Legally, too, she's in for some difficulties, though I'll make every effort to see that she's not involved in espionage charges."

"I suppose that Jeremy will squander away his uncle's fortune."

Baker shrugged. "Perhaps. We can only hope that somewhere in him lies a kernel of good sense. Perhaps the events of yesterday will help to bring it out."

I allowed myself a small grin. "Speaking of money, Baker, I observed that you specified considerably more than your usual fee in this case. Seventy-five thousand, wasn't it? You wouldn't be becoming mercenary in your old age?"

The bubble popped and he blew another. "Not in the least sense, Woodside. I merely realized that the inheritance would be considerable and chose this opportunity to ensure that at least some of it would go to a worthwhile cause."

"What do you mean?"

"I'll be donating the bulk of my fee to a certain organization."

I was silent a moment. Once again that feeling that I was playing a part taunted me from the edges of my consciousness. "What sort of organization?" I asked.

"Eleemosynary, my dear Woodside," Baker said, "Eleemosynary."■

● The savage bows down to idols of wood and stone: the civilized man to idols of flesh and blood.

GEORGE BERNARD SHAW

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The Alternate View

LOVE THAT SHUTTLE!

G. Harry Stine

Americans love their space shuttle and are in favor of spending several billion dollars to develop the full potential of space.

In view of the old Thiokol poll made in the late 1960s and the general disaffection with the space program revealed by the news media and echoed by the actions of a Congress responsive to this media reaction, this statement sounds highly suspect. Is it just more wishful thinking on the part of space advocates out to sell the space program at whatever the cost to the taxpayer?

No, it derives from a national survey conducted by Louis Harris & Associates between May 6 and May 10, 1981, in which 1,250 adults over the age of 18 were asked the question:

"It could cost the U.S. government several billion dollars to develop the full potential of the shuttle over the next 10 years. All in all, do you feel this space program is worth it?"

Immediately, someone will state that, regardless of the numbers, a sample of only 1,250 people out of more than 200 million doesn't tell you much. But the Harris pollsters pointed out, "In a sample of this size, one can say with 95% certainty that the results are within plus or minus three percentage points of what they would be if the entire adult population had been polled." Since Louis Harris & Associates make it a business to conduct polls, and since they would not be able to stay in business if their poll results did not reflect the reality of the world for the benefit and use of their clients, one must therefore accept their expert opinion as one must also believe that the planet Pluto is really there after all, in spite of the fact that the distant world looks just like another star on photographic plates.

In all cases, the various categories gave an affirmative answer to the Harris poll question with the exception of blacks, who opposed it.

I am not attempting to draw any racial conclusions; I am reporting data. Draw your own conclusions.

Remember, the poll was taken almost a month after the exciting flight of the space shuttle *Columbia*. Therefore, one cannot claim that the success of the flight skewed the results—although it would be interesting to see the results of a poll taken a month *before* the *Columbia* flew because that flight certainly changed a lot of minds in a hurry. Nothing succeeds like success. Even the Harris pollsters remarked that the initial flight of the space shuttle "has had a dramatic impact on Americans."

The total results of the 1,250 people polled showed 63% in favor, 33% opposed, and 4% unsure.

Of the men polled, 76% were in favor, 21% opposed, and 3% were not sure.

Women showed less enthusiasm, only

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52% being in favor with 43% opposed and 5% unsure.

Breaking down the categories into even finer groups, the Harris pollsters discovered that Republicans showed a 71%-26% split, Democrats a 57%-39% split. Conservatives: 66%-30%. Liberals: 58%-41%. College-educated people showed a split of 71%-26%. Blacks opposed the space-shuttle funding by a margin of 53%-45%.

Louis Harris & Associates went on to observe, "The key to this new renewal of faith in the space program seems to lie in some of the practical uses that people expect to be realized by the new space program."

The Third Industrial Revolution has finally become a decisive factor in the minds of Americans! Their reactions to five specific applications areas of the shuttle warmed the cockles of my heart, because I *knew* that Americans would support a space program when they got a straight answer to their question, "What's in it for me? And how can we make a buck doing it?"

COMSAT has been making money at it for over a decade; the dividend checks keep rolling in while over two-thirds of the world's telecommunications traffic now goes through satellites. Of the people polled, 64% thought that the space shuttle held the promise of putting new communications satellites in space at a much lower cost.

American concern with health came through when 82% stated that it is very important to use the space shuttle to conduct experiments with new pharmaceuticals that can help cure diseases.

Some 55% of the Americans polled felt it was important to use the shuttle for scientific research on metals, chemicals, and living cells—in short, space processing.

The capability of the space shuttle to rendezvous with, repair, or return malfunctioning satellites was considered important by 47%.

One of the big areas of contention has been the use of the space shuttle for defense purposes, and there has arisen a vocal minority, especially among the news media, who are opposed to any military utilization of the space shuttle. However, the majority of the American people don't feel that way. The Harris poll showed that a whopping 68%—more than a two-thirds majority—felt that the space shuttle holds out the prospect of developing a military capability in space beyond what the Russians are doing.

"The success of the space shuttle seems to have begun to rebuild national pride in our technical know-how. Specifically, after a long period of doubt about the usefulness of the space program, Americans are now ready to support U.S. efforts in outer space," concludes the Harris organization.

I will not blush with false modesty because I sensed this as Apollo 17 was on its way to the Moon, and I said so in public.

And it was published in this magazine first. The initial article was entitled "The Third Industrial Revolution," a two-part science-fact article that began in the January 1973 issue. I cannot claim full credit for the concept of the industrialization of space, however, since *Analog* and *Astounding Science-Fiction* before it have discussed and displayed—in contributions by various authors and artists—the various aspects of

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space industrialization for at least the last quarter of a century.

It took less than a decade for the far-out speculation of the Third Industrial Revolution to penetrate the American consciousness as the reality that it is. I believe that Americans knew it and sensed it all along, but nobody—including NASA—took the trouble to explain it. Even today, most of NASA's publicity speaks of the scientific exploration of space, and various space scientists still deliberately ignore or downplay space industrialization because they're afraid it will take funding away from *their* projects.

You betcha I fault NASA on this one! Eyebrows go up and lips are curled when my name is mentioned in the hallowed halls of NASA Headquarters, and not just because of *Shuttle Down*. (Most frequent comment from NASA officials and bureaucrats upon reading that novel was, "Who was the sonofabitch who wrote *this?*") NASA is an outstanding R&D outfit; they are staffed and manned and equipped to do great things at the leading edge of technology, as they so amply proved with the STS-1 flight. But, in spite of some outstanding people in NASA who were the prototypes for Casey Laskewitz, Red Richardson, Joe Marvin, and the other fictional characters of that novel, they have proved themselves incapable of telling their story to the American people. To some extent, they have pandered to people in the news media who call themselves "science reporters" and who are nothing more than journalists who've been told by the assignment editor, "You're a science reporter now. Go cover the shuttle flight." (Gentle readers, I *watched* these people in action at both Cape Canaveral and Dryden Flight Research Center during STS-1; I know whereof I speak.)

And you betcha I'm feeling good and justified and proud at this moment. The shuttle works as many of us said it would more than a year ago when we stuck our necks out. A space program that provides real value for the hypothetical Man On The Street and that allows people to make a buck in the process *is* the way to go.

And now that we know, what the hell are we fighting about? If we're going to save the world by doing it in space, we'd better get cracking, because the world isn't going to wait while we study it to death or fight over how to carve up the government budgetary pie. Time to put our risk capital where our mouths have successfully been for ten years.

And that doesn't mean writing reams of letters to congressional delegations. Sorry about that, Jerry. The white papers of the Citizens' Advisory Council for National Space Policy may or may not have been read in the highest offices in the land, but as of this writing they have not had one whit of impact upon the national space policy we do not yet have. The long-range view requires that we learn to speak the language of *real money* to those who have it: the financiers, financial analysts, bankers, investment brokers, and entrepreneurs. Then we must go and talk to them in their language. If the American people are willing to back a space program with their tax money, they will certainly back it with their investment capital. And the results will be much more palatable to American taste. ■

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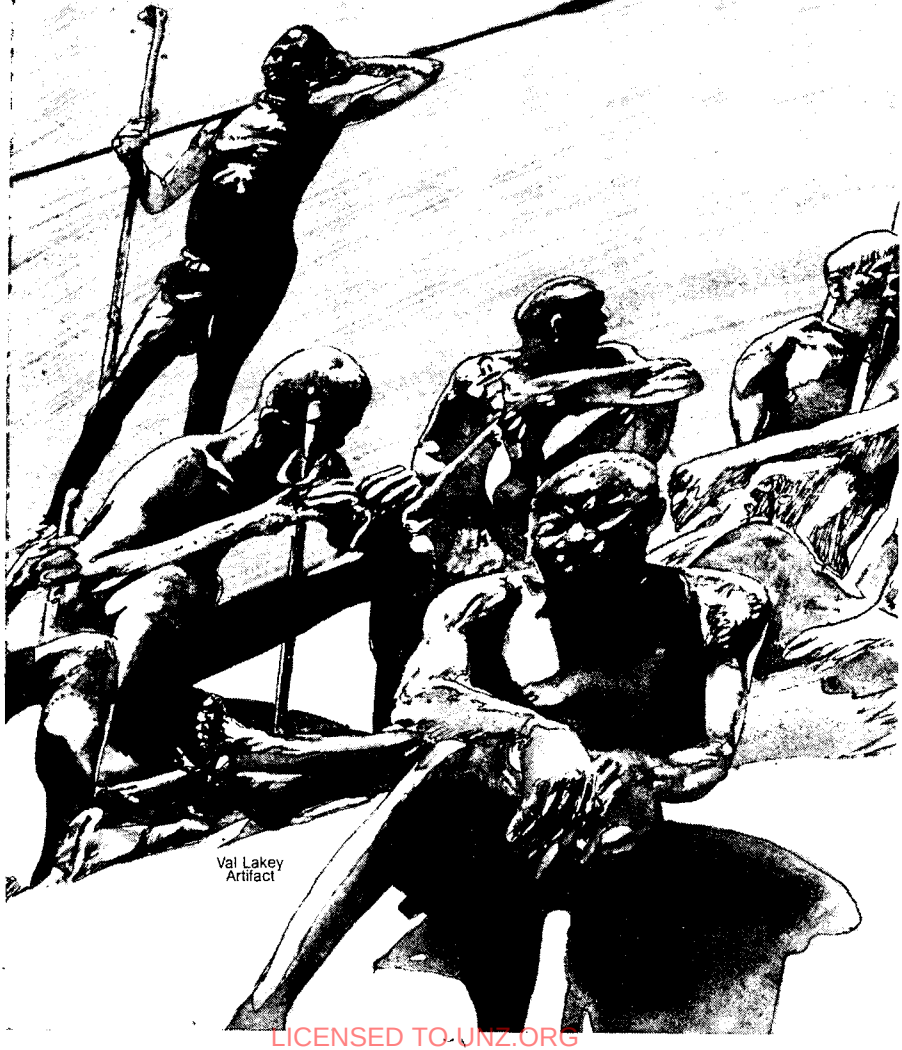
Edward A. Byers

A LITTLE MUSCLE



Val Lakey
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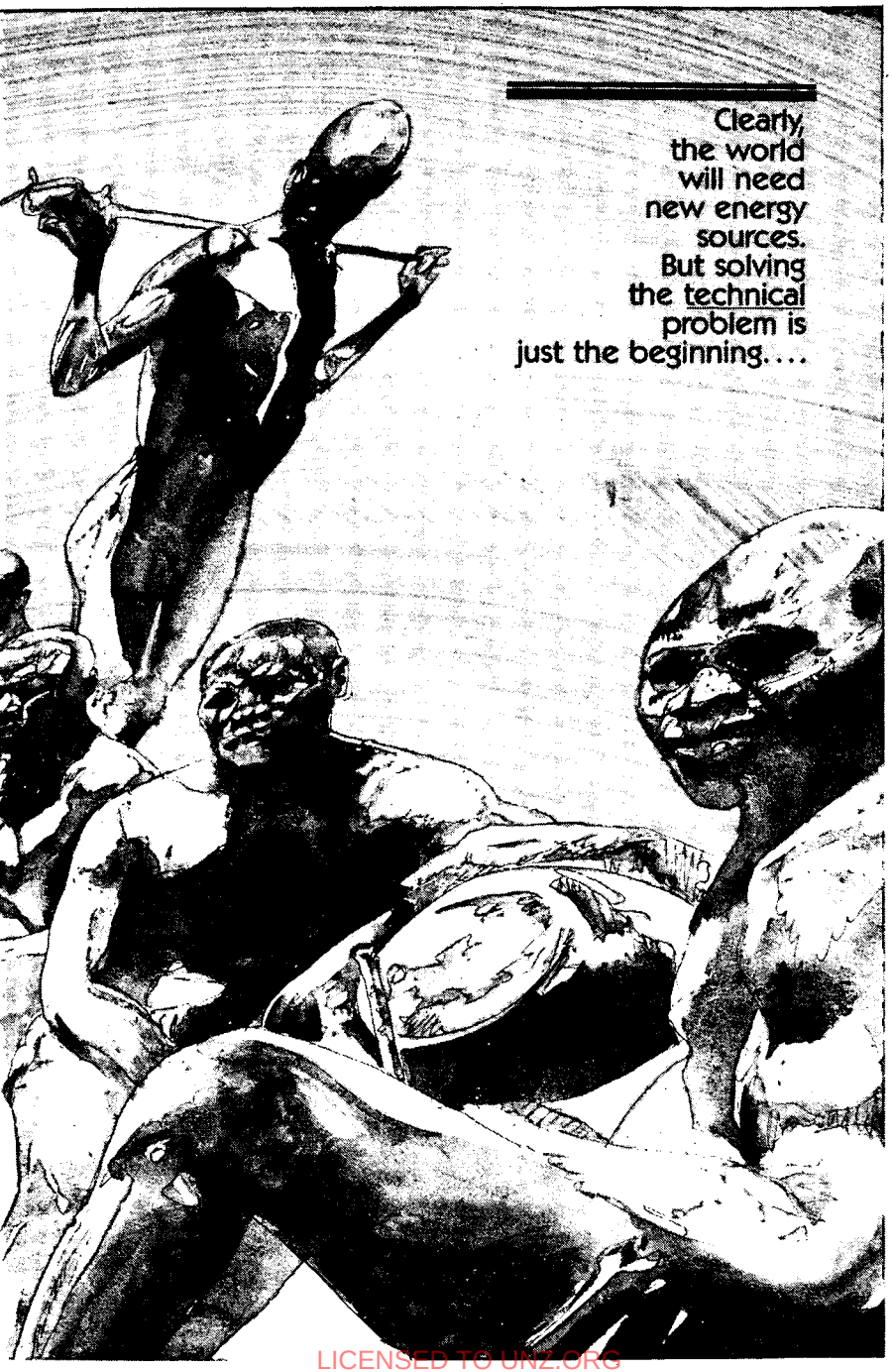

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Outside the low packed-mud soddy that housed the pumping monitors, the sun beat down with relentless ferocity. Inside the building, Jeff Michaels struggled with a stuck metrazol valve and cursed the swollen African sun. Why, he wondered, did he have to be here in February, the hottest goddam month of the year. If they had been able to keep to schedule, the whole Naiad team would have been back in Chicago by now. And, he noted savagely, they would have been a damn sight wealthier.

The air was stifling, and he coughed deep in his chest as he twisted the valve. Abruptly the thing freed itself, and Michaels jerked his hand out of the way. *There, by God. . . !* A fine stream of clear fluid shot out of the open line into a holding tank located just beneath it. There was the sudden overpowering odor of moulting feathers mixed with ammonia. Michaels slammed the tank lid shut before he gagged.

Outside the soddy he paused, a thin young man with short sandy hair and a belligerent jaw. He felt the sweat trickling down his chest and checked the thermometer taped beside the door. One hundred nine degrees! Hot enough to fry an egg, if he had a skillet and an egg. He grimaced and let his eyes follow the pipeline running out of the soddy until it disappeared in the distance. That way lay Lake Ngama, acre after shimmering acre of the bluest water Michaels had ever seen. Eyes on the pipeline, Michaels tried to imagine water racing through it, feeding the desert, turning the brown waste to green. The image would not come. Not yet. He sighed and swung himself behind the wheel of a dusty Willys jeep. As the vehicle ground itself to life, he pondered the odds of Project Naiad succeeding and felt more than faintly discouraged. The project was already two months behind schedule. Unless new funds were found, its future looked dim indeed.

"Come in below," a voice boomed suddenly from his right. Michaels recognized the dry New England twang of his colleague and friend, Mark Buetel. He punched the button on the walkie-talkie lying on the seat beside him and quickly scanned the sky. Over to his left he saw a silver and blue insect that quickly grew into a converted Super Stearman, an old single-engine biplane. It waggled its wings at him as it swept over.

"How does it look?" Michaels asked.

"Antelope going over the line set off the sensors," Buetel told him. "We're still in business." Then he added significantly: "For now." The biplane dwindled to a flyspeck in the sky. Then abruptly the little plane banked, dipped its wings again, and came roaring back toward the soddy.

"Ho!"

"What's the matter?"

"You have visitors, old buddy."

"Where?" Michaels peered ahead, saw brown dunes and little else. There seemed nowhere for anyone to hide.

"About half a mile ahead," Buetel told him. "They're in a gully where the old creekbed used to be. I caught a flash of something."

Michaels slackened his speed but did not stop. He had met the Naron tribesmen before, knew that they were fascinated by the American "crazy man"

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and his crew. He had nonetheless treated them with dignity and patience, had found that attitude returned in kind. Rather to his surprise, he had found himself liking them.

"You want me to stick around?" Buetel asked. The little Stearman made an elegant maneuver and came around behind him.

"No, thanks. I shouldn't have any problem. They're probably just keeping out of the sun until it cools off a little—like we should be." Then, struck by a troubling thought, Michaels added: "You didn't see any guns, did you?"

"Nope."

"Okay, then. See you back at the station."

Michaels slowed further when he neared the gully, preparing himself for anything. A thin wiry form rose suddenly from concealment, blinked owlishly at him, raised one hand in the air. *Parley*. Michaels recognized the wrinkled, strangely childlike face and grunted in relief. Old Ungka, one of the Bushmen with whom he felt most at ease.

He braked the jeep and got out, thankful that the trail was hardpan and that there wasn't the usual accompanying blanket of dust. Fanning himself with his hat, he stared down at the native. Ungka spoke a fractured English, better by far than Michaels's own Setswana. The little Bushman had tracked for survey teams in his youth, learning as he did a cockney rendition of the Queen's English. As well as Setswana, the primary language of the country, Ungka spoke the oddly clicking language peculiar to the Naron. He had lived in the desert all his life. His single garment consisted of a thin rope of cloth wound around his loins. All his possessions were carried in a bag slung across his shoulders.

"Hello, Ungka," Michaels said. He nodded affably at the other.

"Hello, crazy American," Ungka replied, and grinned, displaying the gap prominent between his front teeth. Grinning seemed to be the old man's answer to everything, including the scorching midday sun. He regarded Michaels for several seconds, his mouth a split vee, then blinked out at the brown waste.

"You must like the desert, mon. You drive here often?"

"No," Michaels retorted vehemently. "I don't like the desert." He shook his head for emphasis. "Particularly when the dust is so thick I can eat it." He slapped the leg of his trousers and watched a small cloud of yellowish dust billow out.

"It's not so bad, mon," the Bushman said. He was silent for a space of ten seconds and then said obliquely: "The desert never changes. You know, there is much of me here." Two distinct sentences. Two distinct thoughts.

Michaels didn't know what to say. He said nothing. After a moment Ungka held his arm out from his side in a peculiar motion that left the palm open. Almost timidly then, the rest of the Bushman party came into view. There were ten, none taller than four feet. Michaels recognized several, gave them tentative smiles.

There was one, however, whom he did not recognize: a bullet-headed man with powerful sloping shoulders. He was definitely not a Naron tribesman; he towered over the others like a hulking giant, his face flat and hostile. His gaze,

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when it found Michaels's, was frowning and intent.

It was this man who spoke, and Michaels snapped his head up, startled. He had heard that dialect before—8,000 miles away. It had the soft rolling drawl of the Cajun south. Louisiana, he guessed. Bayou country.

"You have permission to set up a research station here?" the man asked. Hard eyes stared at him.

"Yes."

"Let's see it."

Michaels hesitated, more puzzled than intimidated. Then shrugging, he leaned over far enough to dig a sheaf of papers from the jeep's glove compartment. He exhibited it, showed the government seals, the signature of the Minister of Mineral Resources and Water Affairs.

"Are you from Gaborone?" he asked.

The other man's eyes glinted. "No."

Michaels gave a short resigned nod. "I didn't think so," he said dully. "You're *kgatla—guerrilla.*"

The man smiled for the first time, displaying a perfect set of block-like teeth. He said, "You got it, chum. The name is Gautscha."

"I was in New Orleans once . . ." Michaels ventured, and saw Gautscha's smile grow broader.

"Louisiana State University," he said tightly. "Anthropology. It's good to know your roots."

Michaels detected the sarcasm and grinned back stiffly. He returned the government permits to the glove compartment before speaking.

"You an American?"

"Uh uh. I'm *african*. With a little *a*. So don't try to box me in, man." He looked suddenly angry. He turned to Ungka and rattled off a tirade in machine-gun Setswana. Michaels recognized only one word in ten. But, he thought sourly, the tone was the same in any language.

Ungka listened quietly, his back straight, his fingers gently wadding the fringes of his loincloth. The smile had slipped from his lips, leaving his features expressionless.

When the big man had finished talking, there was a short silence.

Ungka turned his head, looked at Michaels. "Gautscha wants to know," the old man said with dignity, "what it is you do here in one of the deserts of Africa."

"We're putting in a pumping station," Michaels said shortly. "We're bringing water to this part of the Kalahari."

"Gautscha asks why you don't build your pumping station in the deserts of America. What is it you are hiding?"

Michaels stole a glance at the slope-shouldered man. He got a blank look in return, an opaqueness that shrouded the other's thoughts. He shrugged and spread his hands. The man was playing games, albeit dangerous ones.

"Botswana authorized a grant for my work," he said to Ungka. "The Ministry of Mineral Resources and Water Affairs offered me money, a place to work, and hands off while the project was underway. And the offer was immediate. I took it—*hell no*—I jumped at it. I suppose I could have gone through channels, gotten a grant for work in the States. But all that would have taken time . . . and this was a bird

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in the hand." He shrugged again and stopped.

"Gautscha also wants to know," Ungka continued softly, "*how* you will pump the water from Lake Ngama."

"It's no secret," Michaels said with a touch of exasperation. "One of the space laboratories was doing an experiment of mine in polymer chemistry. One of the by-products was a sort of synthetic fiber." He looked at Ungka, then at the larger man beside him. "When the fiber is brought into contact with metrazol crystals it contracts. Violently. Think of it as a muscle—it works practically like one. We've built pumps utilizing the principles involved. In two months—I hope—we will bring water here from Lake Ngama."

"For Botswana!" Gautscha spat suddenly, incensed. "For this tiny government! Not for a United Africa!" His hands clenched and unclenched and the muscles along his jaw bunched into knots.

A fanatic, Michaels thought bleakly. And one with a god-awful short fuse. He was aware of the suddenly charged atmosphere, the tension that clung to the big man like a stink. Gautscha, Michaels perceived, was balanced on a razor's edge, fury bubbling in him like tar in a leaky cauldron. He stared at the other, and almost but not quite took a backward step. No, by God! He'd be damned if he'd let this *kgatla* cow him.

"It's not only for the government," he said stiffly, his shoulders squared. "It's for the people of the desert."

Gautscha cut him off with a savage gesture.

"Liar! Your papers say you work for the fat ones in Gaborone. You are not an african!" He glared. "Are you for the revolution—or against it?" He waited, his face set into hard inflexible lines, his eyes darting black beads.

"I'm nonpartisan," Michaels said as forcibly as he could. He straightened and returned the other's gaze. For several years the guerrillas had been sniping at the government, hoping to draw it into open conflict. The cause was an intangible, an impossibility. A United States of Africa, a single unity that would dissolve the differences between tribes, factions, nations. Of late, because of an extensive drought, the movement was growing more powerful. The guerrilla leaders, men of education and background, were coming out into the open. Michaels feared civil war and wanted no part of the conflict.

Gautscha snorted. "There are no nonpartisans. There are only friends—and enemies. And you are not *african*."

"The struggle is not mine," Michaels said wearily. "And I'll not make it mine." He made as if to turn away, then stopped and looked at Ungka. "But if you want to know," he said, putting his hand on the bushman's shoulder, "*this* is *africa*."

After a moment of charged silence Gautscha's lips worked their way into a frosty smile. The tension eased somewhat.

"I'll give you that. He is. And call me Cutter, why don't you? My name was George Cutter when I was in Louisiana."

Ungka chose to view Cutter's grin as a sign that all was well. He raised his arm and pointed north. Without a backward glance the little band of Bushmen gathered their meagre belongings and

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started out. There was, Michaels recalled, a water source in that direction called Keitsa Pan, but it was many miles away.

By the time Michaels got back to the compound he was in a vile mood. The jeep had broken down two miles from the station and he had had to tear the carburetor apart to get it running again. He desperately wanted a drink, a shower, and eight hours' sleep, preferably in that order.

He found Mark Buetel at the radio console, wearing one earphone, whistling the Colonel Bogey March. There was an empty beer mug by his elbow.

"I talked with Joyce a few minutes ago," he said when he saw Michaels. "She's flying in tomorrow."

"With good news or bad?"

Buetel gave him a thumbs-up sign and a grin. "She got the money angle all taken care of. More than enough."

Michaels's mood immediately lifted. He hadn't believed she could do it, but Joyce Stanham had proved him wrong. Fan-tastic! With adequate financing, he was sure they could bring in the water.

"There's a hitch," Buetel was saying. "Good news, bad news sort of thing."

"What is it? Strings on the money?"

Buetel grunted, hitched himself forward in his chair. "You could say so. Some representative of the foundation committee. He's coming along to see how the money is being spent. And don't blame Joyce—it's the only way she could get it."

"If you talk to her before I do, give her a kiss for me," Michaels returned, grinning. He entered the compound's tiny living quarters and, as always, stopped to peer through the glass sides of Unit One, the aquarium-sized predecessor of Project Naiad.

On the floor of the unit was what looked like an undernourished rope. It was transparent, almost colorless. Short lengths of braided nylon webbing stretched from either end of it to ceramic rings. The rings were attached to posts jutting down from the aquarium's steel top. Half of the tank was filled with fluid. Metrazol and water. And a catalyst.

Michaels watched, fascinated as always. The rope was flaccid now, having just completed a cycle. He checked his watch and waited. At nine the rope began to contract, the center of it thickening, pulling against the webbing. At sixteen the rope had turned itself into a fat slug of polymer. And, as its length decreased, the nylon restraints lifted it from the tank floor. At the count of nineteen the slug had risen above the surface of the fluid, pulling the webs taut. Twenty-two seconds after Michaels had begun counting, the posts began to deflect inward toward their common center. The energy thus produced transferred itself to a flywheel located in the steel top, and a second later a tiny light glowed atop the tank. Unit One was producing energy, as it had continuously for the preceding eleven thousand hours. Michaels grunted his satisfaction and continued counting.

At forty-two, the slug had given up enough metrazol and catalyst to once again turn rope-like. Its descent through the fluid reminded Michaels of sea snakes he had seen off the coast of California.

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He checked the readouts from the monitor unit and noted without alarm that the rope was losing mass. Nothing comes from nothing. Still, the trade-off was damned good! He turned away into the living quarters. In the cabinet located above the bookcase he found a full bottle of scotch and broached it. Things, he murmured to himself, seemed to be looking up.

In her Gaborone hotel room Joyce Stanham kicked off her high-heeled shoes and threw herself into one of the grotesquely over-stuffed chairs. Mentally she compiled a list of regrets, chief among them her agreement to stay over in Gaborone with Harlan Walker. With any luck at all they would have made the airfield at Tsau, and Mark could have picked them up there in the Stearman. By morning they could have been back at the research station.

There was a knock on the door and Joyce reluctantly got up to answer it. Regret number two. Harlan Walker's gentle insistence upon a seduction scene.

Gaborone was not known for its fine restaurants. Harlan Walker, however, had managed, in less than an hour, to find a tiny intimate cafe that served elegant *petit mignon*.

Walker was a tall man, on the shady side of fifty, lean, fit, with piercing blue eyes and graying russet hair. Joyce supposed most women found him attractive, although he seemed . . . too packaged, somehow, for her tastes.

There was no question that Walker found *her* attractive, however. Joyce sighed and sipped her Chablis. Being pretty had always been a two-edged sword, an asset and a liability. She caught a glimpse of herself in the wine glass and stuck out her tongue. Short curls, of a shade known as burnt umber, framed a face all cheekbones and eyes. She had thought of modeling once, before she met Jeff Michaels and was bitten by the research bug.

Walker looked at her, his gaze direct, his interest genuine. "How long have you been in the Kalahari?"

"Jeff started the project just over a year ago," the girl told him. "Mark Buetel and I have been with it about eight months. Mark's an ex-cropduster with time on his hands. I'm a graduate student in catalytic chemistry." She did not add that she had given up an assistantship at Berkeley to become a member of Project Naiad; she had never really been that much into the security thing anyway—had always considered herself a gambler at heart.

Walker stopped eating and lifted an eyebrow. He said, "You want to know the truth, Naiad sounds a lot like those old perpetual-motion engines people used to come up with. They always managed to fool *some*body." He smiled to take the sting out of his words, but Joyce found herself growing angry anyway. Kneejerk reaction, she chided herself, and from someone who doesn't know a polymer from a polyglot.

She managed to hold herself in check long enough to work up a smile in return. "It's not that at all," she said. "Very simply, the *muscle* is a strand of neo-amorphous polymer—Jeff calls it fibrilite—that contracts when it is brought into contact with a solution of metrazol. There's a catalyst in there that gives it an absolutely *horrid* odor. Like wet hens in an ammonia bath. That's where I

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come in." Joyce paused. "Fibrilite does wear out. It loses mass. It's nothing like perpetual motion. And anyway, that is part of our experiment here: to find out just what the parameters are." She stopped and looked thoughtfully at her dinner companion. "All of that was outlined in our grant proposal. Surely you've read it."

Harlan Walker nodded briefly, gave her a wry smile. "I understood about one word in four. Just enough to know why the foundation was willing to take a flyer on you."

She shot him a sardonic look. Something told her that Harlan Walker knew a damn sight more about chemistry than he was letting on. Part of it was hunch and part of it was a cold logic that said it was bloody unlikely the foundation would send an utter zero to assess their investment.

So why the subterfuge? She studied him covertly, gooseflesh making Sasquatch tracks up her spine. Was he a threat to the project? Or did Walker have something to do with the foundation's speedy approval of the Naiad grant? It was possible. One day she had been mired in the murky shoals of a bureaucracy; the next she'd found herself on the plane back to Botswana—with Harlan Walker in the seat beside her—and with the grant papers signed. It *could* be just coincidence. Or it could be something else. She frowned and gave him a final hard glance.

The object of her scrutiny didn't seem to notice. He gave her a guileless look and leaned forward to refill her wine glass.

He asked, "Those space experiments Michaels was involved in. Anything ever come of them?"

"No, worse luck," Joyce said shortly. The thought of the two aborted experiments brought with it a flurry of helpless anger. Both experiments had dealt with neo-amorphous polymers. Joyce had slaved with Michaels over the preliminaries. The projects had been well conceived, minutely planned, endlessly perfected. But both of them required follow-up experiments, and they had been bumped from the following shuttles. Infuriating. Oh, it went on all the time, the jockeying for space aboard the shuttles. Joyce knew it. Michaels knew it. But it didn't make it any easier to swallow when your own projects were washed out. And, Joyce reflected somewhat bitterly, anytime anybody whispered *national security* shuttle assignments tumbled like dominoes.

Outside the restaurant the beginning night was cool, the sky filled with an avalanche of stars. The two began walking toward their rented car.

"It's too bad Botswana didn't renew your grant," the foundation man said. "Do you know why they didn't?"

"Priorities," Joyce said, shaking her head in a somber exercise of negation. "There's growing sentiment for a United States of Africa. Botswana has more than its share of revolutionaries. Our work went on the back burner."

Walker took her arm, then suddenly looked up and stopped in midstride, pulling the girl back toward him. His mouth made *ga-ga* noises. Abruptly he gave a low self-deprecating laugh.

"Damn! The stars—they're all different!"

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Joyce couldn't help grinning. "Your first time in Africa?"

"Yes."

"We're right on latitude twenty-five degrees south. Everything looks a little different from this angle." She pointed. "There's Canopus. And over there is Achernar. They're both first magnitude or better."

The other looked a moment more, then his hand tightened on her arm, drawing her close against him. She stiffened reflexively, angrily, feeling the sudden raw strength of his grip. He hadn't developed *that* shuffling papers across a desk, she thought in near panic. What was he? Who was he?

"Those revolutionaries you mentioned," Walker asked in a whispered voice. "They come in to Gaborone?"

Joyce sensed an urgency in the question. While the grip on her arm did not slacken, there was nothing about it to suggest he meant to harm her. It was just that she felt so damned helpless!

"They stay out in the bush," she said, her own voice muffled against his chest. "And let go of me—*right now!*"

"Take it easy," Walker said softly. He looked down at her. He was tense, but there was a hint of a smile on his lips. "And keep talking, will you?" There's somebody in the shadow of those trees just ahead. I saw a flash of something—steel maybe."

They had slowed their steps, and Joyce looking up past the tall man's shoulder, saw the vast bridge of stars that marked the heavens. Her mind grasped at his words. Guerrillas? This close to the seat of power? She had heard they were growing bolder, but not that they were strong enough—or foolish enough—to challenge President Mogwe.

When they approached the line of trees, Walker leaned toward her, murmured: "When I let go—start running. Don't stop until you're back at the restaurant." There was a steely quality of command to his voice; it was the voice of a man used to being obeyed.

Joyce was far from satisfied. She opened her mouth to say something, then closed it. *Things were happening too fast. . . .*

Abruptly Walker released her. She stumbled, took half a dozen running steps, then turned to look back.

There were three of them, a trio of shapes that moved purposefully forward, flanking the unmoving figure of Harlan Walker. Joyce caught the liquid sheen of a machete blade, the instrument upraised. *My God,* she thought unbelievingly. *They're going to kill him!*

The tall man held his ground until the blade began its descent, its length fractured into shards by the web of starlight. At the last moment he moved—not away, but toward his attacker.

Frozen, watching, Joyce heard the man's sudden grunt of pain, the unmistakable dry-stick popping sound of broken bones. She saw the machete fall from nerveless fingers as the guerrilla crumpled.

There was a sudden barking cry from Walker's right. Joyce recognized an epithet in lurid Setswana. A second dark shape launched itself at the American. Seemingly without effort, the tall man swung his left leg around and extended his torso. His heel connected heavily with the other's temple. There followed

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a howl of pain that chilled Joyce's blood.

The third shape moved slightly forward, hesitated for a space of a second, then faded again into shadow. Walker took two quick steps toward the trees and stopped. Joyce heard the quick slap of footsteps as the man ran. The entire episode, from first warning to final result, had taken no longer than thirty seconds.

"I thought I told you to go back to the café," Harlan Walker said when he stepped to the girl's side. "You could have gotten hurt."

"Oh, sure," Joyce breathed. "*I* could have gotten hurt?" She stared at him, eyes enormous, heartbeat rapid. She felt a wave of something that was almost suffocating but did not stop to analyze it. She looked again at the fallen forms. "The only way *I* could have gotten hurt is if one of them had had a *bazooka!*" She paused, turned back, half laughing, half hysterical. "And—my god—you're not even breathing hard! What are you—a one-man army?"

The other laughed, his dark brows lifting into rueful arches. "No. But I'm not with the foundation, either. I guess that story seems a little threadbare right now."

"Just a little," Joyce said, her lips twisting. "What are you really—CIA?"

A head-shake. "I'm with the Lambda Bureau. I'm supposed to keep a watchful eye on Naiad."

Joyce looked up at him without speaking. She had heard of the Lambda Bureau; it was a controversial offshoot of the old Department of Energy. It was, she recalled, headed by a maverick physicist named Timmons, who had, in the space of a bare six months, gained a reputation for brilliance—and ruthlessness.

Walker suddenly grinned. He took her arm gently, almost shyly. He said, "I don't know about you, Miss Stanham, but I could use a drink."

In spite of herself, Joyce found herself responding. Damn! The man had charm when he wanted to use it. She pulled back a little and peered upward. "Let's go," she said, her voice harsher than she had intended.

Seated in the candle-lit dimness of the hotel's bar, Joyce took a sip of a rum concoction and lit a rare cigarette. Across the table her companion sat studying the smoke as it eddied from the tip of the cigarette.

He said, "The world has a problem—diminishing supplies of fossil fuels." He picked up his drink, stared at the ice cubes, then set it back without drinking. He looked at Joyce. "The hell of it is, the way we're using them up, we're headed for a crunch before the middle of the century. A *bad* crunch." He shook his head morosely. "We humans seem to be born profligates. And fossil reserves aren't going to last forever."

Joyce said quietly, "What has the Lambda Bureau decided to do about it?"

Her companion gave her a sober look. "We've set up a computer scan on all research efforts currently ongoing in the energy field. Everything goes in, even the fringe—the crackpots. The computer does an extrapolation, then prints out the research programs in the order of probability of success."

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Joyce was silent for a moment, watching the smoke ladder into nothingness. "Where did the computer place Naiad?" she asked finally.

"Eighth. Enough to rate a field man."

"So you *did* pressure the foundation to sign our grant."

Walker shrugged. "Time is of the essence. We didn't want the project to fail simply for lack of funds. Not when the computer says fibrilite may have a future."

Joyce said nothing. She thought instead of the desert's stupefying heat, the endless stoop labor, the heart-breaking reverses the team had faced. There had been faulty pipe, fierce windstorms, wormy food. *And* lack of money. None of it had stopped them. It had, in fact, simply stiffened their resolve. Walker, she decided, had literally no idea of the team's commitment. Or of its resilience. She felt a swell of pride. They would have to blast the three of them out of the Kalahari with high explosives before they'd abandon Naiad. They *knew* the principles were sound.

"What happens," she asked, "when Naiad is proved successful?" She watched Walker's lip twitch. He'd noted the wording; she had said "when" and not "if".

"It gets funding," Walker said promptly. "The Lambda Bureau will underwrite construction of a pilot generating station—using fibrilite as the power source." He paused and stared down at the back of his hands, then abruptly raised his eyes. He said, smiling, "And that will be only the beginning."

They sat for a moment in silence. From somewhere came the sound of a guitar, the tune plaintive, subdued. Joyce started to say something, then turned her head and stopped. A stocky man in the pale linen dress of the African civil servant had come into the bar and was looking around. He saw the two Americans and came toward them. When he arrived at their table he bowed slightly, then brushed them both with a carefully measured smile.

"You would be Harlan Walker?" he asked of the tall man.

"Yes."

"And this young lady?"

Joyce gave her name and waited. The African was covertly studying her, trying to find a slot in which to put her. Finally he arrived at a conclusion as erroneous as it was acceptable.

"You are . . . ah, with Mr. Walker?"

"No!" Joyce snapped. She detested inferences like that; she'd endured them all her life. "Mr. Walker is with *me*. *I'm* with Project Naiad."

"Ah, yes. So. Please excuse me." The gently smiling face accepted the rebuke without altering an iota. The man's eyes swept from her to the Lambda agent.

"You have made plans to fly to Tsau, I believe?"

"Yes."

"Then I must tell you, sir, that such a flight would be most inadvisable. That entire area has for the past few hours been under guerrilla rule." The Botswanan smiled a trifle tightly, his face registering a faint embarrassment. "It is only a temporary condition, of course. Our troops will deal with them in good time." He paused, then continued. "In the meantime, why don't you relax here for a few days. Gaborone is a very beautiful city. There is much to see."

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Joyce stared at the man blankly. Then comprehension flooded through her and she let out a little yelp. Her head jerked up. The airfield at Tsau was not *that* far from the Naiad research station. Perhaps even now Jeff and Mark were being . . . She sprang to her feet, spilling rum across the tablecloth. *She had to get to a radio!*

"Come *on!*" she said to Walker. Then, not waiting for him, not looking at him, she bolted for the door.

She felt his hand on her shoulder just as she reached the exit. Harlan Walker, she recalled then, could move very rapidly when the occasion demanded it.

Jeff Michaels struggled to open his eyes. He'd been dreaming; he could remember it vividly—someone had been calling him.

Then he heard it again and it wasn't a dream.

"Jeff! Get your butt in here. We've got problems."

Still fighting cobwebs, Michaels slipped on his robe and walked barefoot into the adjoining room. He glanced at a clock on the way, saw he'd been asleep for four hours.

Buetel was standing in the darkened living room. He was holding a Colt automatic in one hand, his attention riveted on something outside.

"What is it?"

"Damfino. Come take a look."

Michaels peered out of the window, could see nothing. Gradually, as his eyes focused, he made out a long line of dark bodies standing rigidly erect. The silence was absolute, eerie. Michaels could feel goose flesh forming on his arms and legs.

"What do you think?" Buetel asked. "Guerrillas?"

"I guess so," Michaels said. "But what do they want?"

A moment later there was a gentle, precise knocking on the door.

Michaels switched on a light, motioned the other to put the gun away. "We might as well let them in," he said. "I can't see us fighting an army."

The knock was repeated. Michaels took the two steps necessary and opened the door.

The first thing he saw was a wide grin full of square white teeth. He took a step back and George Cutter entered, followed immediately by half a dozen other guerrillas. They fanned out, their weapons, of a make unknown to Michaels, looking nonetheless deadly.

Cutter stopped in the middle of the room and stared at both researchers with hostile eyes. The grin came back, a mocking grimace that merely touched his lips.

He said softly, "In Gaborone they are trembling, the fat ones. They know the revolution has begun. By now our advance teams will have entered the city. The day of a United Africa has come."

Buetel's head snapped up. He said angrily: "Who the hell are *you*—Genghis Khan?"

"Stow it, Mark!" Michaels said. He gestured the other to be silent. Buetel could not know. Cutter was unpredictable, a zealot, a border paranoid. Michaels feared him as he might fear a fulminating cap left too long in the sun. Anything was capable of setting him off.

But it was almost as if Cutter had not witnessed the incident. He said nothing.

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He surveyed them both in silence, then stepped close to Michaels and patted him expertly, looking for hidden weapons. "Please sit there," he said when he was through. He pointed to a chair beside Unit One. Michaels sat, one of the guerrilla soldiers staring down at him with expressionless eyes, his weapon a few inches from Michaels's temple.

"And now you, sir," the guerrilla chief said mockingly to Buetel. "What are *you* hiding?"

Buetel looked belligerently at him for a long moment, then at the soldiers. His face took on a sudden pasty look. Moving in exaggerated slow motion, he inserted two fingers beneath his shirt and brought forth the Colt. He handed it over gingerly, keeping the weapon at arm's length.

"That's very smart," Cutter said in his southern drawl. His lips moved into an approximation of a smile. "You could get my men upset, and that would be too bad." He took a step forward, still smiling, and drove his fist into Buetel's midsection. The pilot doubled over, gagging, his face turning a sickly green.

Standing over him, Cutter said: "But hiding a weapon . . . that could get you killed."

Michaels started to get up, thought better of it, settled back in the chair. He tried to ignore the rifle barrel that pressed suddenly against his neck.

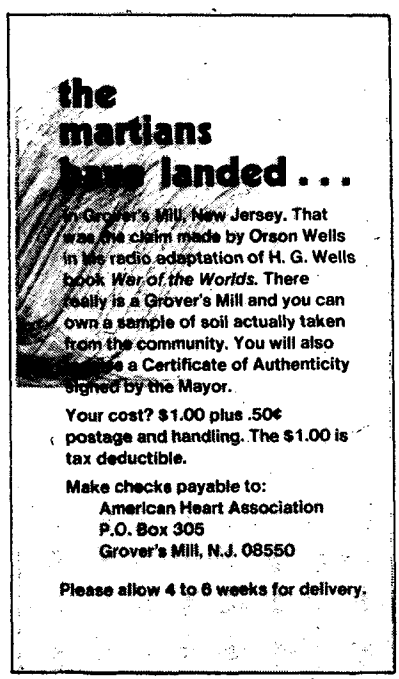
Cutter had caught the movement. He swiveled around, fixed Michaels with a flat eager stare that underscored his hostility.

Good God! Jeff thought desperately. *He* wants *me to try something. He's waiting for me to react.* Deliberately he relaxed his muscles, willed his fear into submission. He stared at the big African, almost but not quite meeting his eyes. *Be damned if he'd play into the man's hands. . . .*

Buetel had recovered enough to half-stand. One of the guerrillas guided him to a chair and he slumped there, face pale, sweat standing out in huge droplets on his forehead.

"What do you want with us?" Michaels asked the revolutionary. "That pistol is our only weapon. There's no way we can threaten your cause."

Mercurially, Cutter chuckled and relaxed. The grin came back. He strode


the
martians
have landed . . .
in Grover's Mill, New Jersey. That
was the claim made by Orson Wells
in his radio adaptation of H. G. Wells
book *War of the Worlds*. There
really is a Grover's Mill and you can
own a sample of soil actually taken
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a Certificate of Authenticity
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Your cost? $1.00 plus .50¢
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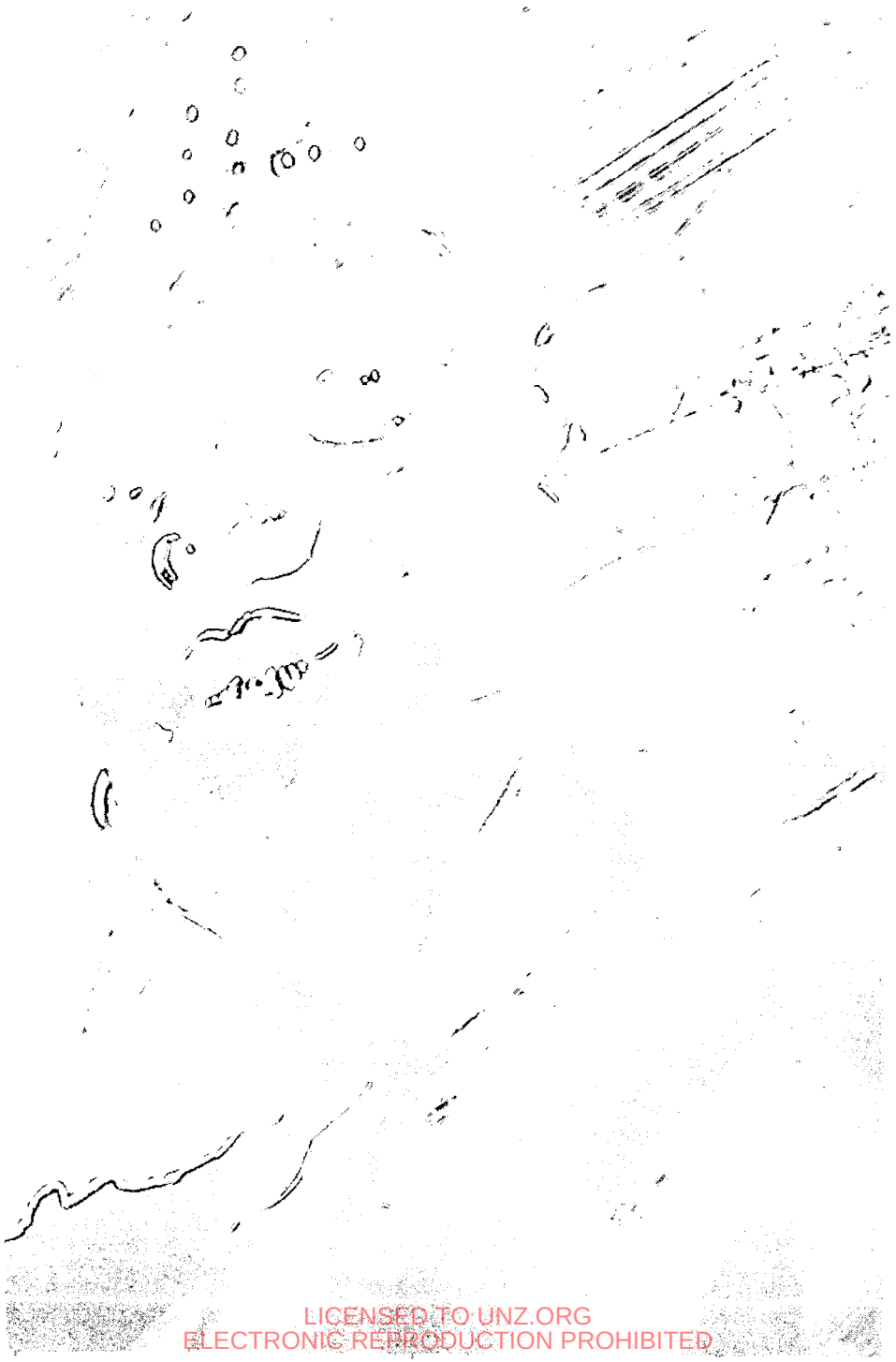

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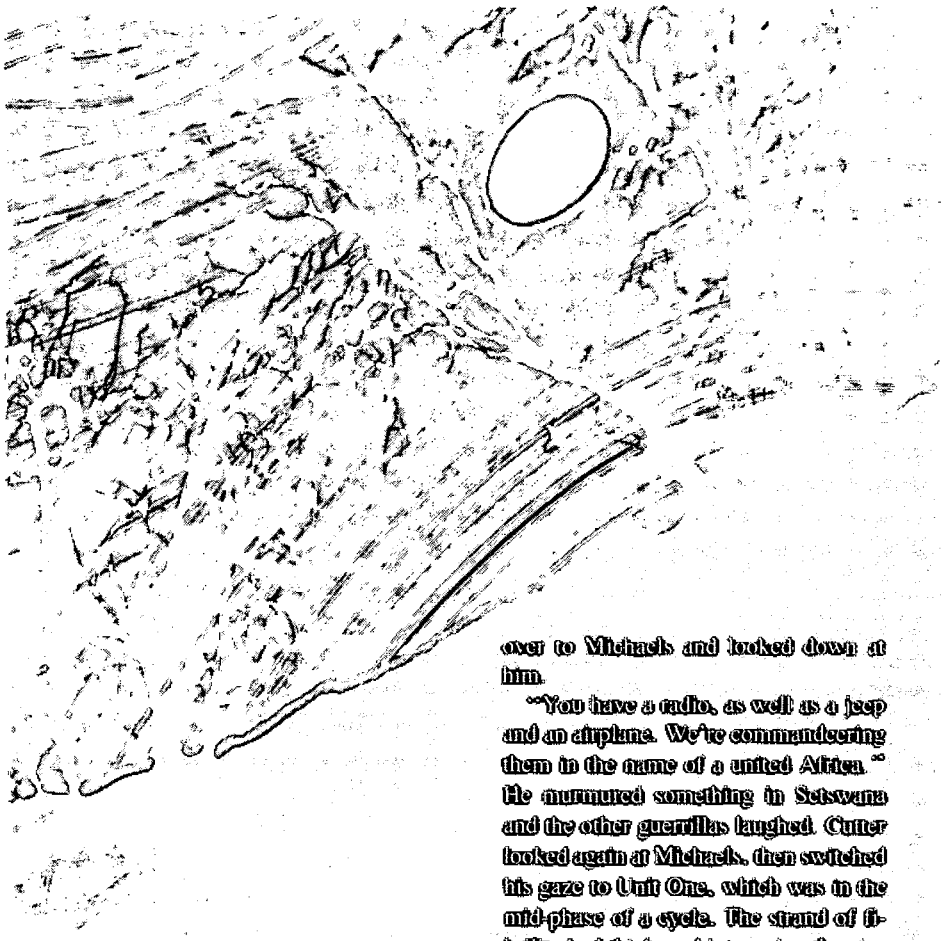

over to Michaels and looked down at him.

"You have a radio, as well as a jeep and an airplane. We're commandeering them in the name of a united Africa."

He murmured something in Setswana and the other guerrillas laughed. Cutter looked again at Michaels, then switched his gaze to Unit One, which was in the mid-phase of a cycle. The strand of fibrilite had thickened into a slug the size of a baby's fist and hung suspended between its nylon restraints. While they watched, it thickened further, ultimately clearing the liquid's surface and deflecting the posts. Cutter's eyes flickered to the top of the tank as the light there began to glow.

"What is this?"

Michaels explained.

Cutter watched thoughtfully as the fibrilite gave up its load of metrozol and sank again to the tank floor. He turned to the researcher then and his eyes challenged the other.

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"*This* is what brought you to Africa?"

Michaels nodded. "That fiber, bound into thick cables and using the same, or a more efficient energy-release paradigm, can pump enough water to make the Kalahari green. And it can do it unattended—for years."

The guerrilla chief flicked his glance back to the tank. His jaw muscles bunched, and Michaels somehow got the impression he was observing a throwback to some more primitive, more elemental man.

Abruptly Cutter's arm blurred forward. He struck the glass side of Unit One with his clenched fist, shattering it into pieces. He grinned as catalystic fluid flooded over the arm of the chair. drenching the sleeve of Michaels' robe. Then he caught the characteristic odor and his mouth twisted in disgust.

"Filth! This has the stench of foreign pestilence! It *should* be destroyed!" He back-pedaled quickly, then said something harsh to his followers. Both researchers were hauled to their feet. Michaels, half blinded by the metrazol-catalyst mix, felt his stomach heave in reaction to the fumes. He heard Buetel yelp in sudden protest as they were unceremoniously ushered through into the radio room. There was the sound of a door slamming and then that of a window being opened.

When he could breathe again, Michaels rubbed his eyes and looked about for Cutter. The revolutionary was leafing through the radio log book, a thoughtful expression on his face.

"Who is Commissioner Mookodi?" he asked, pointing to an entry.

"Our liaison man in Gaborone," Michaels told him. He stole a glance at Buetel, saw him knuckling weepy eyes. Several of the revolutionaries were likewise affected.

"I hope for your sake he is willing to pay for your release," Cutter told him sharply. He turned away, presenting Michaels the back of his shaven head.

Michaels snorted. He was tired of being bullied, of being used as an object of scorn. He said, "They turned down our request for a grant renewal. There's not a hairy chance in hell they'll pay our ransom."

"Not even for someone who is going to make the Kalahari green?" Cutter asked sarcastically. He turned back, looked at the other.

"No."

"That's too bad." The big man paused, rubbed a hand across the top of his head. "What is in that small building behind this one?" he asked, changing subjects.

Michaels blinked, shrugged. "Pipeline supplies. Nothing that would interest a revolution."

The other gave him a baleful stare. "Oh? And how do you know what might interest a revolution?" He prodded Michaels with a massive forefinger, nodded his head at the door. "Let's go see, shall we?"

Inside the storage building, Cutter shone his flashlight over a stack of boxes and half a dozen piles of pipe. Further back were loose bundles of what looked like straw, and a truncated pyramid of hundred-pound bags.

"What is in the boxes?"

"Pipe fittings."

"And the bags?" The guerrilla's light flickered over the pyramid.

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"Metrazol," Michaels said shortly.

Cutter said something in rapid Setswana. The guards clustered by the doorway moved closer, pressing their weapons against the researchers' backs. The big man left them and strode forward. He removed a wicked-looking knife from his belt and ripped one of the bags open. A pile of loose crystalline powder formed on the floor. The revolutionary picked up a handful, sniffed, then threw it down in disgust.

"More chicken-dung!" He spat the words, then set his mouth thinly and gestured to his subordinates. In five minutes the bags of metrazol were gone, as were the lengths of pipe and boxes of fittings. Cutter kicked at the straw bundles, sent them all scattering. He glanced from Michaels to Buetel and back again. His smile took on a manic quality. He spoke in Setswana for a moment, then made a brief gesture with one hand.

"You will stay here while our forces consolidate their victories. Then, if the fat ones pay the price. . . ." He shrugged, then turned abruptly and left, clanging the door shut behind him. Michaels heard the padlock snapping closed in the eyebolt that held the door, then nothing.

Beside him, Buetel moved fractionally, scuffing his feet against the concrete floor. "Kee-rist!" he said explosively. "They're not going to pay for our release. You told him that. We could be here forever." His voice trailed off into uneasy silence.

Michaels, pondering the heavy darkness pressing down upon them, was struck by another thought, hideous if it was true. The storage building was corrugated steel on a concrete base, the single door quarter-inch steel. There were no windows. He remembered the scorching midday sun. Chances were he and Buetel wouldn't last long enough to be ransomed. Death would come from dehydration and heatstroke. More likely than not, he thought grimly, this place would become their tomb.

Sometimes, Joyce Stanham was later to admit to herself, clout did come in handy. A hurried telephone call by Harlan Walker, followed by a hell-for-leather taxi ride, got them to the American consulate in under ten minutes. There they had a radio capable of link-up with a satellite—she had contact with Project Naiad.

Her first attempts were fruitless. Joyce had vivid mental images of Michaels and Buetel lying helplessly in pools of their own blood. In her mind's eye she saw the downward jerking stroke of a machete, razor-like and deadly. She shuddered. How could the guerrillas have expanded their base of power in so short a time? Perhaps they had come across the border. There were rumors of a militant fringe in Zambia. . . .

The air waves suddenly crackled. She heard a voice, though not one she recognized. She glanced in near panic at Walker, then punched the button and responded.

"Who is this, please?"

"The name is Cutter," the voice answered in deceptively soft tones. "Who are you?"

"This is Joyce Stanham calling from Gaborone," Joyce answered. "I'm part of Naiad. How are Jeff Michaels and Mark Buetel?"

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There was a pause, then the radio crackled. Cutter said, "Your colleagues are fine, Miss Stanham . . . for the moment." His voice trailed off into a whisper, and Joyce took her hand from the microphone as though it had grown suddenly hot. She shot a glance at Walker.

"He's one of them—a guerrilla!"

Walker nodded grimly, and the muscles bunched along his jaw. He said, "I'd give a lot to put that voice through a stress analyzer. Keep him talking. See if you can talk to Michaels or Buetel."

Joyce let five seconds tick by before thumbing the speaker button. She felt cold and suppressed an urge to shiver. It was an effort, she discovered, to keep her voice even.

"Mr. Cutter?"

"Call me George," the voice rasped from the speaker.

"All right, George," Joyce said. "If Jeff and Mark are fine, let me talk to one of them."

"Sorry. They're tied up at the moment." There was an abrupt laugh and the sound of a foreign language. Joyce recognized it as Setswana, but could not make sense of it. After a moment Cutter spoke again, his voice hard and flat. "Listen, lady—if you want to see either of your friends alive—you'll do exactly as I say."

"Go ahead," Joyce said. Her head moved fractionally, easing tension. She was suddenly grateful for Harlan Walker's presence, his skill in dealing with the unexpected.

"I want you to fly over the research station in three days' time," Cutter said. "Drop out a hundred thousand in American dollars. When you've done that, both men will be released."

Joyce gulped, her mind reeling at the thought of trying to acquire that amount of money. The entire new grant came to scarcely half that. She looked at Walker, saw him shaking his head.

He said, "There's not a chance of raising that kind of money. And even if you could I doubt if the government here would allow you to pay it." He paused and frowned. "And there are no assurances that Michaels and Buetel are even alive."

Joyce turned back to the microphone. She was suddenly sick with fear. Jeff and Mark might be dead already—or they might not. If they *were* alive, perhaps she could buy them time. She said, "I'll get the money—somehow. But let me talk to one of them. I've got to know they're all right."

She heard Cutter's rasping laugh. Cold and measured, yet at the same time derisive. It made Joyce's flesh crawl. "Get the money, sugar. Then we'll talk." There was another burst of Setswana and then the connection was cut.

The girl swung around in her chair, her thoughts in disarray. If the ransom money was out of the question, then what was left? She had a mental picture of Jeff Michaels smiling at her, his skinny frame jackknifed into one of the over-stuffed chairs he'd insisted on bringing down from Jo-burg.

She looked at Walker through eyes that stung. "Damn it—you're with the Lambda Bureau! What can we do?"

"Not much from here," Walker answered in grim tones. He scratched his head and looked thoughtful. "If this government works the way others do,

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they'll low-key the guerrilla action. That means it's close to certain they're not going to be concerned about an isolated research station." He paused. "If there is anything to be done, we'll have to do it ourselves."

"But what?"

Walker gave her a wan smile. "That's the riddle. Why don't you go get us some coffee? I've got to make a phone call." He pointedly ignored the carafe and coffee service a consulate aide had placed on a serving cart.

Joyce nodded and stood. He would be phoning for instructions from Ralph Timmons, and the conversation would be scrambled on both ends. *For what good it would do,* she thought miserably.

She wandered out of the communications room, shut the door, and slumped in a chair. She felt shell-shocked, numb. Without having to think it through, she knew Walker was right—there would be no help forthcoming from the local government. Oh, they'd be responsive to her desires, but that responsiveness was good only up to a point. It did not extend to the recapture of a remote compound on the edge of the Kalahari desert. They would be civil enough, she was sure; her request would be politely taken down—held for future reference. What had the man said. . . ? " '. . . relax here a few days. Gaborone is a very beautiful city. There is much to see. . . .' "

Damn—and damn again!

She jerked her head up sharply when Walker emerged. The big man's face was slightly flushed and his handsome features were twisted into knots of determination. Someone, Joyce thought briefly, had read him the riot act.

He glanced in her direction, raised a hand fleetingly. He said, "I want to get a look at this research station. Can you guide me?"

Joyce rose. "Of course. I've made the trip several times. We'll have to angle away from Tsau about ten degrees, but that shouldn't be a problem." Struck by a sudden thought, she asked: "Where are you going to find a plane this time of night, and a pilot that flies bush?"

Walker grinned at her thinly and stabbed a finger at himself. "The consulate keeps a Beech six-seater at the airport, and I'm qualified for night flying. The problem is range—we'll need somewhere to refuel."

"There's an airfield northwest of here." Joyce said. "It's tiny, but it should have fuel. Park police use it, and I've seen bush planes there."

Walker raised his eyebrows. "How far is it from the research station?"

Joyce shrugged. "I'm guessing —maybe two hundred miles."

Walker's grin widened. He took the girl's arm. He said, "Then what are we waiting for?"

From 6,000 feet Joyce looked down, saw a dwindling spiderweb of light, Gaborone. Ahead, she made out the faint glow of Molepolole, a town to the northwest.

The Beechcraft was responsive and the weather was proving not to be a factor. They made good time, the sleek little craft booming through the night sky. Walker's hands on the controls were firm and sure.

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"Where did you learn to fly?" Joyce asked.

An enigmatic shrug was the only reply. He glanced at her, then held her gaze. "I'm going in as close to the station as I can. You can dodge it if you want to. I'll let you out at Lake Ngama."

"I'm staying," Joyce told him hotly. "Besides, you can't fly a plane and shoot, too." She rested a hand on a cased hunting rifle brought with them from the consulate.

He gave her an acknowledging nod. "Thought so. Okay, here it is. I talked with my bureau chief. He's going to twist tails in Washington and some here in Botswana. And believe me, he damn well can do it! He assures me there'll be a strike force ready to retake the Tsau region in under a week." He paused and made a slight adjustment of the controls. "He left it up to me—to us—to see that Michaels and Buetel stay alive for that period of time."

"How will we do that?" Joyce asked. Again she saw the machete descending, blood spurting. She shivered.

The Lambda agent touched the controls again slightly. He gave her a lopsided grin. "I asked Timmons that," he replied briefly. "He didn't have an answer."

Jeff Michaels stopped at the door after his third circuit of the storage building's confines. The structure was a 14 by 12 rectangle with a peaked roof. It had been built tightly enough to keep out mice and snakes. Michaels slid his fingers down the inside of the door until they found the handle of the inner latch. He pushed down and felt the mechanism give half an inch before the padlock brought it up short.

"That maniac with the fists," Buetel said from the darkness. "He seemed to know you. Who the hell is he?"

Michaels finished examining the door while he explained about meeting Cutter in Ungka's band.

"Holy damn *hell!*" Buetel said when he finished. "He talks southern. And he's certainly no Botswanan."

In the darkness, Michaels shrugged. "Your guess is as good as mine. I doubt if he's American, though."

"Imported terrorist?"

"Most probably," Michaels said. He dropped to his knees and ran his fingers along the bottom of the door. Cold steel. Standing once again, he made a fourth circuit of their prison. He felt like a caged animal, like a cougar he'd seen once in a zoo, prowling tirelessly around the limits of its cage.

"You might as well get some sleep," Buetel said after a moment. "We're not getting out of this box until they *let* us out."

Much as he wished otherwise, Michaels had to agree with his friend's assessment. Escape from the steel room seemed hopeless. He flopped down on the cold concrete and stretched out, his head resting on one of the bundles Cutter had kicked following his inspection. "One thing to be thankful for," he commented meaningfully, "Joyce wasn't here. I'd hate to think what they would have done to her."

Buetel grunted assent and Michaels heard a rustling sound as the other adjusted one of the straw bundles. "She said she would call in before she gets

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to Tsau. When she doesn't hear from us she'll know we have problems."

Listening, Michaels decided the other sounded only vaguely hopeful. He peered into the darkness, saw nothing. He asked, "What time is she scheduled to call?"

"Middle of the afternoon."

Too late. By midafternoon they would be dead or very close to it. He stirred, half sat up. It was time the other man realized what faced them. He said, "We have to get out of here tonight, Mark. Tonight—or never."

Buetel roused himself. "Why? You think they're going to kill us, come morning?"

Michaels said bitterly, "No. I think they're going to leave us right here. They're going to let the sun take care of everything else."

Buetel belatedly comprehended their peril. He swore, then jumped to his feet and banged on the door with a heavy fist. There was no reply, and after a moment he stopped, his hand aching where it had struck the steel.

"They can't even hear us," he said dejectedly.

"What would you do if they could?" Michaels wanted to know. He squatted on his haunches, his back against the steel wall, his mind in ferment. There *had* to be a way out.

Buetel came toward him in the dark, stumbled over one of the loosely bound bundles and crashed heavily to the concrete. The offending bundle rolled to a stop against Michaels's legs and he picked it up.

"Are you all right?" he asked. He could hear stentorian breathing and mumbled curses coming from the other.

"Yeah. I'm all right. Only from now on I'm going to *stay* down."

Michaels said, "Oh, well . . ." and then stopped. His mind kicked suddenly into overdrive and his fingers tightened convulsively on the bundle.

"What's the matter?" Buetel asked.

"This," Michaels said. He held the invisible bundle up in front of him, shook it. "Cutter must have thought these were hay or straw. They look enough like it to pass—and he's never seen unactivated fibrilite before. . . ." He stopped again, his mind working feverishly. He remembered the pile of metrazol that had resulted from Cutter's knife thrust and moved crabwise across the floor to where the bags had been stacked. His fingers found the little pyramid of powder and he grunted in satisfaction. Thank God the catalyst was already in the metrazol. . . .

"I hope you remember your boy-scout days," he said with more hope than he felt. He glanced in the direction of the other. "We have fibrilite—and a double handful of metrazol."

There was a moment of puzzled silence, then Buetel said, "So?"

"So," Michaels said, and paused. "We're going to make a rope."

Two hundred miles to the southeast Joyce watched as Harlan Walker topped off the Beechcraft's tanks. They had almost missed the minuscule airfield, had had to circle twice before she'd seen the familiar outlines of the two-plane hangar.

"Coffee?" Joyce asked. She looked up at the tall man, offered a smile and a white styrofoam cup. He took both, stood sipping the hot liquid thankfully,

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his eyes drawn outward to the blackness of the African night.

"How serious is this revolution?" Joyce inquired, taking a sip from her own cup. "Can they really unite Africa?"

Walker glanced her way, shook his head. "I asked that of Timmons. He said maybe in twenty or thirty years, if they bide their time, and build. Right now their movement is too splintered, and it lacks a charismatic leader. The most they can do is incite civil war, take over a few towns and cities." He shrugged. "You saw what they were like in Gaborone—little more than street thugs."

"To you, maybe," Joyce returned sardonically. "But not to me—and certainly not to Jeff and Mark."

"You have a point," Walker admitted with a grin. He crushed his cup in one powerful hand, then leaned down and capped the fuel tank. "Let's go and get them," he said. "It should be easy."

He didn't believe it.

Building a rope was not the simple thing Jeff Michaels had supposed it to be. For one thing, the polymer fibers were stiff and hard to work with. His fingers felt as though they were being flayed with knives. He finished tying off a bunch of fibrilite and paused. Buetel, working on the other end of the rope, suddenly cursed and sucked in a deep breath. Michaels grinned ruefully. He wasn't the only one having problems.

Using his spread hand—six inches between thumb and forefinger—Michaels measured what they had wrought. It came to a shade less than fourteen feet. Not yet enough. Grimly, he flexed his swollen fingers, reached for another bundle of fibers.

He stopped when they attained a length of seventeen feet. Then he went over the rope again, searching for weak spots. Total darkness made his task tedious and difficult, but their lives depended upon the thing withstanding severe strain; they could ill afford to have the rope part because of faulty construction.

Satisfied at last, Michaels followed the wall back until he was at the point farthest from the door. There was a large *X* there, formed by intersecting support beams. He tied one end of the rope to the middle of the *X*, snugged it down by dint of placing a foot against the wall and pulling.

"Cross your fingers," he muttered to his fellow prisoner, and gave a little sigh. It was now or never, and he didn't care to calculate the odds against their plan succeeding.

"They've *been* crossed," Buetel's voice said from the darkness. "Ever since you first mentioned this crazy stunt."

Michaels walked forward until his groping hand found the door. He tied the free end of the rope around the door's inner latch, covered it with his robe. He drew the rope as tightly as he could.

"Okay," he said. "Bring the metrazol."

Buetel removed his shirt and transferred the small pile of white crystalline powder to it. Carefully then, he followed the rope forward until his hand found that of his friend.

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He said, "This stuff is no good without water, you know. Where are we going to get water in here?"

"Don't be naive," Michaels said briefly. "Just be thankful you like beer so much."

In five minutes they were ready. Starting at the back, they applied the metrazol solution as evenly as possible to the fiber strands. Around them the air became redolent with the odors of moulting feathers and urine.

Buetel stopped and wiped his brow. "This gives new meaning," he said with exquisite distaste, "to the phrase 'pissing up a rope'."

Beneath their fingers they could feel the fibrilite begin to contract. Soon the rope was iron-bar taut. They continued the application of the solution until both crystals and water were exhausted, then backed quickly against the wall. They could hear a metallic creaking as the structure adjusted to the strain.

Abruptly there was a loud cracking sound, followed by a muffled clanging of metal against metal. The latch had been pulled apart, the inner portion sent crashing (covered with Michaels's robe) against the rear of the building. Taking a deep breath, Michaels stepped forward and ran his fingers over the door. He found the metal stub where the latch had broken, pressed on it with his thumb, felt resistance, pressed harder. The outer latch fell free with a metallic clatter. Michaels let out the long-held breath and pushed open the door.

He was surprised to note a grayness in the east. Dawn was not far off. There were lights on in the research station, more lights by the airstrip. He could see the Stearman illuminated in the jeep's headlights.

"Let's make for the pumping soddy," he murmured to Buetel. "There's water there and it will give us time to make some kind of plan."

"What are the bastards doing to my plane?" Buetel wanted to know. In the dim light his face had taken on an angry, predatory look.

"I think they're converting it to carry bombs," Michaels said shortly. He reentered the supply building and retrieved his robe. Donning it, he nudged Buetel. "Come on, let's go." He moved to the edge of a small depression and followed it north as far as it went. The night air was cold and he found himself shivering beneath his thin garment. He grinned wryly. The desert was a place of opposites. In two hours it would be a burning hell.

In a quarter of that time the sky had changed from gray to glassy pearl, and there were spikes of green lancing the heavens. There was a small steady breeze blowing at their backs, bringing with it, now faintly, sounds from the research station.

It was fully light when the two heard shots. They stopped and looked at each other, squinting in the sun's glare.

"They checked the storage building," Buetel said.

"It looks like it," Michaels answered. He peered ahead, judging distances. "It's about another mile to the soddy. We have to get there, get that water."

Buetel gave him a bleak look. "What if Cutter knows about the soddy?"

Michaels shrugged and turned away.

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"We have to chance it. We won't last long in the desert without water."

A hundred yards further on they stopped again. Now, distinctly, they could make out the harsh sounds of an overstressed engine. Michaels glanced back, saw a rising dust plume. It was the jeep, heading directly for the soddy.

—Directly for them.

Harlan Walker had been following the faint outline of an old arroyo, the yoke barely moving beneath his fingers. Below the Beechcraft the desert spun away in colors of tan and brown.

"The station is right over that hill," Joyce said abruptly. She pointed, then leaned forward eagerly, her eyes wide and bright.

Instead of going in directly, the Lambda field man eased back on the throttles, then wheeled the aircraft into a tight turn as they approached the research station. He preferred approaching it out of the sun, in case there were marksmen who might take umbrage at his trespass.

Joyce was glad he had. As the Beech crossed over the tiny airstrip, several figures threw themselves on the ground and began firing in their direction. Walker grinned tightly and banked left, coming around for another look-see.

Joyce suddenly grabbed his shoulder. "What's that out there?" she asked, pointing to a rising feather of dust to the west of the station.

Walker eased the aircraft into another bank, bringing the nose of the Beech around. In a moment or two they were close enough to see the hurtling square shape that was the research station's jeep. There were two figures in it. Both appeared armed.

"There! Over there!" Joyce suddenly exclaimed, and Walker glanced away from the jeep. He saw two men scrambling desperately for the protection of a ravine.

"That's Jeff and Mark!" Joyce yelled in his ear. Her face had gone white. She could feel her heart beating wildly beneath her ribcage.

Walker looked for a place to set the Beech down and found none. The desert floor looked enticing enough, but close up it was full of rocks; he could too easily buckle his landing gear. He made a full pass, then did a wing stand and came back, seeing finally an area that was halfway flat and relatively clear of obstacles.

The landing site was just behind a small rise from the jeep and the men it was pursuing. Walker taxied the Beech forward, then swung it around and set the brakes. Face impassive, he picked up the cased rifle, jumped out, began running toward the top of the rise. Joyce, nerves twanging like guitar strings, followed closely behind.

When they reached the top, Walker sprawled out on his stomach and pointed to a slight depression to his left. He said, "Dig in there—and keep your head down!"

Instead, Joyce gazed out at the desert's floor. She saw nothing and turned to look at Walker. "Where are they?"

"They'll be coming into sight any moment. Keep down!" The tall man slipped the rifle from its case and levered a cartridge into the chamber. He peered over the sights at the landscape below.

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The two men came over the lip of the ravine only three hundred yards ahead of the pursuing jeep. They looked weary, and they ran as though they had no reserves left. Walker sighted on the jeep, aimed high, and squeezed off a shot. Dust puffed up forty yards in front of the speeding vehicle.

"Still out of range," the Lambda agent muttered. "But it should slow them down some."

But instead of slowing, the jeep picked up speed, then angled off to the left. *Flanking movement.* Walker narrowed his eyes and stiffened. "One of them has an assault rifle," he murmured to the girl. "If he gets close enough he'll cut us into hamburger."

Joyce looked out at the running figures, at the jeep beyond. She bit her lip. "What can we do?"

"You can cover Michaels and Buetel," the Lambda agent said obscurely. "Here—catch!" He tossed the rifle to the girl, then bent over and tugged at his boot top. Joyce caught the glint of steel as an eight-inch blade appeared in the big man's hand. Almost without pause then, Walker slipped down the back of the rise. An instant later he was running in the direction the jeep had taken.

Joyce followed the tall figure with her eyes for a moment, the suffocating feeling back in her throat. Then she swung around and squinted down the barrel of the rifle. Strangely, her heart had slowed its wild beating; what she felt now was only a deadly calm. *Those bloody bastards,* she thought perversely, *they're not going to sabotage Naiad!*

The sun was on Walker's left. He looked that way and the glare made him blink. He could already feel the pressure of it, like a weight settling on his shoulders. And it was early yet! He grimaced, then stopped and listened for the jeep's engine. He heard it, maybe fifty yards away and to his right. He turned that way, recalling briefly the last time he'd seen someone use an AK 47 assault rifle—it had torn fist-size holes in a sheet of half-inch steel.

The sound of the jeep died out abruptly. Walker looked for cover, found a depression behind a row of thorny bushes and dived for it. Twisting around, he surveyed the washboard-like terrain leading back to the rise. Michaels and Buetel, he noted, were just making it to cover, their figures moving slowly, jerkily, exhaustion stamped plainly on them even at this distance.

"Good men," Ralph Timmons had told him over the telephone. "We need them a hell of a lot more than they need us. This energy thing is coming to a head sooner than we think—and their kind of project is going to buy us time." There was a pause, and then Timmons had continued. "They're the brains, Harlan—but you're their right arm. Help buy us that time."

There was a sudden sound ahead and the Lambda agent swiveled that way, his long body conforming to the slope of the depression. He held the knife loosely at his side, its blade flat along the length of his fingers. Though outwardly relaxed, he was aware of the abrupt spurt of adrenalin, the tension that suddenly gripped his limbs.

For a space of ten seconds there was nothing, and Walker wondered if he'd imagined the sound. Then there was a

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muttered exchange in the language Walker had come to know as Setswana, and he felt a sudden chill. He recognized one of the voices. It belonged to George Cutter.

He waited, feeling the sun's heat against his back. The guerrillas were working their way toward him, his presence as yet unsuspected. Walker smiled. Come on—come a little closer! Silently he drew his legs under him, poised himself on the balls of his feet.

For the space of three heartbeats he thought they were going to pass right over him. Then he heard them turning away, working themselves around the thorn bushes to his right. It was now or never. He uncoiled like a spring, his right arm snapping back and then forward as he rose, the knife cleaving the air with a bright glitter.

Surprise was his greatest ally. The guerrillas were half crouched over, perhaps fifteen feet separating them. The knife struck the closest one as he straightened, a look of incredulity on his face. The blade plunged into his side just beneath the ribcage, going hilt deep. He grunted and fell, and Walker did a dive over the top of the thorn bushes, going for the rifle the man had dropped.

Even as he reached it he knew he was dead. The other man had straightened fully, and his face bore a mask of hatred, of raw fury. Cutter, the Lambda field man thought grimly. He watched the barrel of the other's weapon swing up, and saw a look of wolfish anticipation twist the man's lips.

Something clipped the bush tops and sang past the revolutionary's head at precisely that moment. The guerrilla jerked back involuntarily, and his first

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shot only burned Walker's shoulder. Joyce—good girl! Before the second shot came, Walker had time to swing his own rifle around and squeeze off a shot. Trading gunfire at fifteen feet tended to become a very personal experience, he decided, and one he would have gladly forgone. He knew he was hit, because the bright desert sky was darkening. His only satisfaction was the rounding O of the other's mouth, the knowledge in the other's eyes. *Stomach shot.* The light darkened still more, and Walker rode with it. Finally it possessed him totally, sucking him down into oblivion.

The four people stood quietly, the July sun hot against their backs. There was a breeze, but it was slight. The desert seemed to present a single face, a harsh landscape of brown hills and rocky lifeless valleys.

One of the four figures moved slightly, consulted a chronometer.

"One minute," Jeff Michaels said, and smiled. He looked at Mark Buetel and Joyce Stanham, and then his gaze slid past to take in the figure of old Ungka, who stood as though carved from black granite. A lot had transpired in the past four months, Michaels reflected. The backing of the Lambda Bureau had not instantly solved the research team's problems. There had still been the back breaking work, the long weeks of uncertainty.

But the guerrillas had been—true to Ralph Timmons's word—pushed back into the bush. They had been beaten decisively, and would be a long time licking their wounds. Michaels turned his attention to the soddy that housed the flywheel and electrical generator, and to the sign inscribed in metal above it. Walker Station West. They had put more than labor and sweat into this project, he thought bleakly. They had put blood into it as well. He turned away then and looked again at his chronometer. Thirty seconds. Already he imagined he could hear the rush of water.

"What will you do when the desert is green?" Michaels asked of the little Bushman.

Ungka remained silent. They all watched the pipeline, and beyond it, the unchanging face of the desert. ■

● In the old days, it might take half a century or more to exhaust the possibilities of one great pioneer thinker's discovery. Today, with tens of thousands of brilliant men, with exceedingly powerful analytical tools, such as computer machines, nuclear reactors, and automatic data-gathering-and-processing systems, an idea can be run down in a hurry.

John W. Campbell

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a calendar of analog upcoming events

1-3 January
MINI-CON (SF/fantasy/nostalgia conference) at Houston, Texas. Dealer's room, costume and amateur film contests. Info: Houston Con, Inc., 1251 Wilcrest #7, Houston TX 77042.

14-16 January
TECHNICON IX (SF conference) at Worcester Polytechnic Institute. Guest of Honor—Barry B. Longyear. Info: Technicon, Box 577, WPI, Worcester MA 01609.

15-17 January
CHATTACON 6 (Tennessee-area SF conference) at Read House, Chattanooga, Tenn. Guest of Honor—Larry Niven; Toastmaster—Bob Tucker. Registration—$13. Banquet—$13. Masquerade, video, etc. Info: Chattanooga SF Convention, P.O. Box 921, Hixson TN 37343.

23-24 January
MAGICON at Rault Center Hotel, New Orleans, La. Registration—$5 until 25 December, $8 thereafter. Info: Magicon I, 4567 Cerise Avenue, New Orleans LA 70127.

25-28 January
General meeting of the American Physical Society at San Francisco, Cal. Info: APS, 335 East 45th Street, New York NY 10017.

29-31 January
CONFUSION 11 (Michigan-area SF conference) at Plymouth Hilton, Plymouth, Mich. Guest of Honor—Philip José Farmer; Fan Guest of Honor—Neil Rest; Toastmaster—Larry Tucker. Registration—$12 until 31 December, $15 thereafter. Banquet, masquerade, dealers, art show, etc. Info: Ann Arbor SF Association, P.O. Box 1821, Ann Arbor MI 48106.

27 June-2 July 1982
JERUCON (First International Integrative Congress on Science Fiction, Fantasy, and Speculative Science). Many world-famous SF authors will be in attendance. Info: Organizing Secretariat, Jerucon 82, P.O. Box 394, Tel Aviv 61003, Israel. (Use airmail.)

2-6 September 1982
CHICON IV (40th World Science Fiction Convention) at Hyatt Regency Chicago Hotel, Chicago, Ill. Guest of Honor—A. Bertram Chandler; Artist Guest of Honor—Frank Kelly Freas; Fan Guest of Honor—Lee Hoffman. Registration—$15 supporting at all times. Attending—$45. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Chicon IV, Box A3120, Chicago IL 60690.

—ANTHONY LEWIS

Items for the Calendar should be sent to the Editorial Offices ***five months*** *in advance of the issue in which you want the item to appear.*

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Jay Kay Klein's biolog

Science fiction writers often work in strange or unexpected environments. One woman author says her accustomed place is in a tiny kitchen, where over a typewriter she stares into the blank white side of a refrigerator. James White writes his calm, logical, often humorous, and always warmly human prose in the midst of a fire-fight, in a location all of us have seen who watch television news. He lives in the Andersonstown district of Belfast, which is the epicenter of Northern Ireland's Troubles. He says, "It is a bit strange having to pick one's way through burned-out cars and stuff to go to and from the office, and sitting in the attic trying to write SF in the evenings with all this bloody melodrama going on around us." His attic wall perhaps does have something in common with the writing housewife's refrigerator—both opening to a vision of a wider, better universe.

Jim started reading science fiction at age eleven. He became an active fan as a teenager, contributing artwork and articles to fan magazines—and gaining a reputation at conventions as one of the funniest fans in the United Kingdom. A first professional sale came in a now-defunct British magazine a few months ahead of a first *Analog* appearance in October 1953. "The Scavengers," anthologized most recently by Gordon R. Dickson in *Combat* (Ace Books, 1981) shows what a determinedly pacifistic writer can do with a combat story in which aliens are fought for peaceful, humanitarian reasons.

His famous "Sector General" hospital series originated 25 years ago, resulting from an unsatisfied ambition to be a doctor. In these the conflict comes not from war, but from fighting disease and injury. As in *M*A*S*H**, the doctors don't look with favor on warriors of any side that makes medical repair work necessary. Jim himself has been fighting diabetes virtually all his life, and in recent years diabetic retinal damage has brought on the use of an eyepatch. The story in this issue is a sequel to "Federation World" (August 1980).

Jim was apprenticed as a tailor when still a teenager, working at tailoring until his writing ability eventually secured him a place as publicity officer with Shorts, a Belfast-based aircraft company. His science-fiction writing has led him, as guest of honor, to a number of European conventions, and he was brought over to the United States as GOH at the 1981 Lunacon outside New York City. Eleven novels bear the White name, with a twelfth on the way. In 1972 *All Judgment Fled* won the Europa award for the best SF novel in English for the preceding three years. Jim feels that the best stories are those which face ordinary people with extraordinary situations, and in science fiction, those situations can be extraordinary indeed. ■

James White

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the reference library

By Tom Easton

Science Fiction Book Review Index, 1974-1979, H. W. Hall, ed., Gale Research Co., $78.00, xxii + 391 pp.
The Complete Index to Astounding/Analog, Mike Ashley with Terry Jeeves, Robert Weinberg Publications, $29.95, 253 pp.
A Dream of Kinship, Richard Cowper, Timescape, $2.50, ? pp.
At the Eye of the Ocean, Hilbert Schenck, Timescape, $2.50, 224 pp.
Starworld, Harry Harrison, Bantam, $2.25, ? pp.
Escape from New York, Mike McQuay, Bantam, $2.25, 181 pp.
Mathew Swain: Hot Time in Old Town, Mike McQuay, Bantam, $2.25, 224 pp.
The Last Crime, John Domatilla, Atheneum, $8.95, 155 pp.
The Tera Beyond, Malcolm MacCloud, Atheneum, $9.95, 190 pp.
The Science Fiction of H. G. Wells, Frank McConnell, Oxford, $18.95 hb, $4.95 pb, xiv + 235 pp.
Tarzan and Tradition, Erling B. Holtsmark, Greenwood, $22.50, xv + 196 pp.

How do SF writers make their livings? A very few make them by writing SF. The rest have to work. Many of them teach or write other stuff; I do both.

George Guthridge writes westerns and edits *Western Wildlands,* a quarterly "natural resource journal" from the University of Montana. The other day, he sent me a copy of the Spring 1981 issue, saying the applied sciences deserve as much public attention as the basic ones and suggesting I mention the mag here. It seems he's trying to broaden the readership.

Okay, George. I'll grant you that wildlife and land management deserve attention, and I'll grant you that the mag looks pretty slick. Lots of pictures, glossy paper, and all that. Worth the measly six bucks for a subscription, even if it doesn't go as deeply into things as *Analog* or *Technology Review.* Interesting contents, too, with two land-

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management games that look both playable and enlightening and a piece that surprises me with the news that Montana suffers more environmental impact from bentonite (clay) mining than from coal mining.

Want it, folks? Write the School of Forestry, University of Montana, Missoula, MT 59812.

The things a book reviewer gets in the mail! Paperbacks at two—three!—bucks a shot. Hardbounds at ten bucks and up. And the occasional wallet-buster—Take a gander at H. W. Hall's **Science Fiction Book Review Index, 1974-1979,** at a whopping $78.00.

A bargain, right? Maybe so. Hall did a lot of very painful work to update the 1923-1973 *Index*. He will sell only a few copies to university libraries and monomaniacal scholars. And he deserves recompense.

Hall cites over 15,000 reviews of some 6,200 books—more of each than appeared in the previous 50 years—from about 250 magazines. For each book, he gives the reviews by book title and author and adds the necessary bibliographical information. He does not excerpt the reviews, but he does tell you who wrote them, so that if you want to know what John John said about *Aliens in Dallas* you'll have to look up the review itself. Reviews are not cross-referenced by reviewer, so the book does not lend itself to the study of reviewers, but it is admirably suited to studying the reaction to a writer's work.

You may not care to buy it, but now that you know it exists you can goose your favorite librarian.

Another index—500 copies printed and available at only $29.95 each—is Mike Ashley's and Terry Jeeves's **The Complete Index to Astounding/Analog**—complete, that is, through the end of 1979. A glorious anniversary *Festschrift*, it contains indices to issues, authors and titles for fiction and nonfiction, series, artists, and letters. Editorials and reviews are treated as nonfiction. There are prolificity and popularity analyses, lists of editors and cover prices and page counts.

It's an exhaustive job that may even fulfill Ashley's dream of an index "that supplies any likely item of detail [a] researcher is likely to want." The only things missing—as Ashley admits in his introduction—are indices by topic and theme. Still, it should be an invaluable library tool, so goose that librarian again.

And now for the novels. First, we have Richard Cowper's **A Dream of Kinship,** sequel to *The Road to Corlay*. The time is more than a millennium hence, in a medieval, Church-dominated aftermath of global disaster, the Drowning, brought on by CO_2-induced warming and melting of the ice caps. Kinship is a new religion, brought by a martyred Boy and symbolized by the White Bird. Offering people the best of themselves, it is a faith of life and hope and love, and its growing popularity threatens the Church. The English Lord Constant, feeling especially threatened, orders a massacre of the Kinsmen, priests of Kinship, that backfires when it prompts Brittany to support the survivors and one of his follower nobles to resist his plans to take over the civil realm.

The story is only partly of politics, though. More in the spotlight are the Magpie, itinerant peddler with a second sight that leads him through the massacre; Jane, pregnant with a new prophet; the apostate Francis, who becomes Kin-

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ship's Luther; and the boy Tom, Jane's son, a piper second only to the dead Boy who began it all. Tom is the focus of the book, for events all lead to him and then swirl about him as he develops his preternatural skill with music and finally rejects the role of Kinsman that seems so proper. In the end, he steps off on a path that must appear in another book, one I look forward to.

Dream is a warm book, a loving tale that resonates with our own history and philosophies. It is not a simple retelling of the Reformation, for it offers a new and different faith, not the old with a different emphasis. If that new faith lacks details, we can object that Cowper's imagination has faltered or we can recognize that the details are perhaps unlikely to be in the minds of those who live the story. The spirit is there, and it is the spirit that must gain the converts. Rational, detailed, specific argument never swayed a heathen, and it will never sway a Christian. It will be the example of sanctity and power, and Cowper focuses very much on just these aspects of his characters' lives.

But enough. Read the book. You'll enjoy it. You may even want to find a Kinsman priest. If so, try the next Worldcon. I'll bet you'll find one there.

Hilbert Schenck is already beloved of readers for the stories in *Wave Rider*. Now we have another excuse—**At the Eye of the Ocean,** a historical novel set in the time of another energy crisis (whale oil) that is SF by virtue of its hero's talent for sensing the sea and its positing of transient zones in the ocean—Eyes—that permit a mere human to transcend self and mortality to sense all the connectedness of life and world. It transcends both genres in its concern with the source and purpose of messiahs, in its union of visions of mysticism and ecology. Told in an antique style that fits its setting, it is rich with invention and incident, from the adoption of Abel Roon by Moses Folger after the murder-suicide of his poor-white parents, his initiation into the perils of running escaped slaves north to freedom, his discovery of the Water Speech, a language of sign and sound based on the movements of the sea, the Speech itself, Abel's courting of Hope Mayhew, a woman wholly suited to a messiah, his voyage on a whaleship to the Pacific to seek his first Eye, and much, much more.

The book is a feast made rich by Schenck's ability to visualize connections, whether in his descriptions of scenery or of people. Look for a moment at this passage relating to feminism:

> " '. . . I believe we must either share our futures completely or lapse back into brutality. The deliberate failure to educate young women is no more than a trick to . . .'
>
> " '. . . I know, Professor, . . . But do not fear for Miss Mitchell or Hope. They are, either of them, more than a match for any three of us.'
>
> " 'Why is it we must compete?'
>
> " 'It is their world that they have made, Miss Mayhew,' she said. . . . 'Someday, when their physical strength counts for less than it does now, when their hunting and warmaking are no longer possible because the world is crowded, then they will need what we are and can become.' "

Set a century ago, but written now, we see its provenance. The point may be arguable, but it fits his scene, where his characters confront the real Professor Agassiz and Maria Mitchell, biologist and astronomer, man and woman of distinction in a time when for the latter that was all but impossible. Such

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an exchange would blare of anachronism in too many hands—it may here, to some of you—but Schenck fits it in / skilfully, knits it into his treatment of human beings, of man and woman, of black and white, of old and young. It fits too with his stance toward all of life and all the world in which we must live. Schenck is a loving man, and I would love to meet him.

The third entry in Harry Harrison's current trilogy is now out. In some ways, **Starworld** is good, a pleasure, a satisfying conclusion. At the end of volume two, *Wheelworld,* Jan Kulozik left his family to represent his adopted world in the councils of revolution. Now we see him, promptly captured and shipped back to Earth, a prisoner to be made an example of. He leads an escape, is the sole survivor of the ensuing massacre, and encounters the underground—in a surprising and suspect form. He returns to space to lead the rebels in the last battle, and he wins.

But the book is also a disappointment. Harrison gave us a pawn, turned him into a man-who-can, and now returns him to his earlier status. In *Starworld,* Kulozik is once more pushed by others, unable to control his destiny in any way. Those who—like me—looked for some apotheosis of heroism will not be satisfied. Yet, I must grant Harrison that what he does does have a validity well beyond that of expectation. I've commented before on how the monolithic, in-loco-parentis state may foster adolescent thought and behavior. We may have that here again, with the added thought that when one returns to the home of adolescence, one also returns to the behaviors that were appropriate there.

You say you don't give a stale nougat for "deeper truths"? You say they're just excuses for failures of story? You prefer tales that satisfy on the superficial level alone?

Then try this pair—if there's a shred of deeper meaning, I couldn't find it (though if I just tried a little harder . . .). Both are pure story, mindless entertainment, paper cut-outs of the boob-tube. One is even a movie novelization.

They're from Mike McQuay. The novelization is **Escape from New York,** set amidst a "conventional" US-USSR war, with the US policed by trigger-happy vets. Manhattan Island is a ruin converted to a prison. Snake Plissken is a survivor, mustered out as a hero, turned to crime, caught, and sent to the Big Apple for his sins. At the moment of his arrival, Air Force One crashes on the Island. Snake is offered a pardon if only he will go in and fetch out the President—or at least the briefcase he carries, with its details of a new bomb. The rest, predictable as it is, should go over great on the big screen.

Mathew Swain: Hot Time in Old Town is predictable for another reason. It's not stock Hollywood, but it is stock private eye. It follows the lead of Chandler, Hammett, Spillane, et al, with every cliché in the book as it shows Swain looking into the outré murder of an ex-client, being assigned the case by the stiff's ghoulish Papa, and pursuing it into a ghetto of strange mutants. There's the unprincipled industrialist, the wicked sister, the sexy moll, the girl friend, the tough cop, and bombs and bullets galore. It moves, oh it moves, but so does Ex-Lax.

It *is* SF. You can tell by the furniture, the ruins, the weapons, the mutants, and the dateline. But that Chandlerish sense of despair with society is so prominent that you hardly realize its time is out of joint. Frankly, I say, why not stick with

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the classics, the originals? McQuay doesn't give us enough that's new to be worth our time or money. And he promises us more of the same: *Hot Time* is the first in a series.

By its title, **The Last Crime** should be in the same vein, but it's not. John Domatilla has written a very effective portrait of a totalitarian, polluted England. The last crime of the title seems at first to be a plot to destroy the data banks that give the government its grip on the citizenry, but by p. 150 it is clear that the crime is something else again:

> ". . . our greatest crime, our last crime, started a hundred or so years ago, and it was our decision to ignore every sign of our vulnerability, the vulnerability of our physical world and equally of our minds which patrolled it. It is my conclusion that as a result of this ancient and appalling crime there will now be no after the event. . . ."

The book thus becomes an examination less of crime than of consequence, and its use of the punishment of "slow hanging," apparently by a noose tightened in stages, becomes more than apt. The ambience is skilfully shown as depressing, the weather being described in terms of human waste and the people in terms of fiber, dough, and meat. The prose is marked by a free association that well conveys the illiteracy of the people. The government's attitude is made frighteningly clear in its rewriting of history—Judas has become the boss and Jesus a warlock and traitor—to support an informer's ethic. Domatilla has created a well-integrated vision whose main weakness is his fondness for half witty puns.

Atheneum has a new batch of juveniles out, among which is Malcolm MacCloud's **The Tera Beyond.** Tera is a too-hot human colony that has forgotten its origins. The schools teach evolution as if it all occurred on Tera. When Jawn, a brilliant high-school senior, chooses as an honors project the study of an obscure difference between groups of bacteria, he is attacked by a guilty system. It emerges that the odd bacteria are the last trace of Tera's indigenes, and the novel is the story of Jawn's search for more evidence and vindication. He finds it, but only at the expense of a *deus ex machina* ending that does little to resolve the story.

The premise is intriguing and the story active, if a mite pat. The book's main value to youngsters may be as an example of the value and power of thought, and as such it is well worth their reading.

Robert Scholes is the general editor for a series of critical volumes for Oxford University Press. I've already discussed the Franklin book on Heinlein. Now we have Frank McConnell on **The Science Fiction of H. G. Wells.** It's not a bad effort at all, but it is made slightly suspect by Scholes's "Foreword" comment that SF "privileges the type over the individual, the idea over the word, and the unexpected over the plausible event." He may be right for the ruck of the genre that fails to warrant serious attention, but he is 'way off on the best, which is after all what he is supposed to be attending. The best SF, like the best mainstream, is strong on character and even style. Both the best and the less than best are strong on plausibility, for though to the mundane reader SF may really seem to privilege the unexpected, the experienced reader and the writer know that SF goes to a great deal of trouble to make its events plausible *given an unusual setting*. Rab-

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bits from hats are no less grievous in SF than in other genres. I therefore wonder if Scholes understands SF well enough to call himself an authority on it.

But to the book. McConnell shows Wells as an embodiment and fruition of an age of revolution, dedicated to social reform and working toward it from a seer's podium. Wells, says McConnell, is concerned with "the image of a truly just, truly civilized society as it might appear on *this* planet." (This is true of many modern SF writers, some of whom were once activists of political and social reform—read that, "revolutionaries.") He, "like most great science-fiction writers, is really only slightly interested in" space travel or the real nature of the moon (p. 162) (he said it, not me!). He believed that "fierce individualism, if redirected and creatively rechanneled, could be the salvation rather than the bane of the race" (p. 164) (*vide* Heinlein). Wells was among the first to write SF whose hero is not the individual but the human species (p. 194). And so on.

McConnell discusses only a small portion of Wells's total opus, for the man wrote much more than SF alone. In the process, he identifies themes and thoughts which were to appear again as chief characteristics of such shapers of the field as Heinlein and Campbell, and he shows that Wells indeed deserves the title of SF's father, perhaps more than Verne, who dwelt far more on gadgets than on ideas. The book has a definite place on the shelves of anyone interested in the history and context of the field.

An Iowa reader was kind enough to call my attention to our final entry for this month: Erling B. Holtsmark's **Tarzan and Tradition.** It is a thoroughly academic book, a dry and unentertaining appraisal of language and form, but it does have the virtue of putting Burroughs firmly in a classical context. ERB apparently was familiar with the Greek and Roman epics (the *Iliad,* for instance), and the Tarzan books fit neatly into the form. Yet I wonder. ERB has the reputation of being "superficial," though exciting and appealing. The classics have the reputation of "elemental," embodying the basic elements or archetypes of story, plot, motivation, etc. . . . Holtsmark cites enough detail to put Tarzan in a class with Odysseus, and ERB's writing in a class with Homer's and Vergil's, but I am forced to ask: "What is the difference between the superficial and the elemental?" Have the critics chosen their terms and assigned their values largely according to age? Or is ERB really just superficial and does Holtsmark read too much into his texts?

Every high-school English student raises my first question, which does not invalidate it. Perhaps we should approach that issue of value by saying that the real reason why we downgrade ERB may be that we expect more than archetypes of a modern writer. There has been great progress in our ability to deal with subtleties and great change, great complication, in our views of the world. ERB ignores these changes in favor of an archaic stance toward his material. He seems dated, out of date, unthinking, and hence less worth attending. We feel he has little to teach us.

Or is the problem simpler still? ERB seems distinctly graceless to me, but so does Homer in prose translation. Perhaps ERB would seem more valuable in verse. ■

● It does not pay a prophet to be too specific.
L. Sprague de Camp

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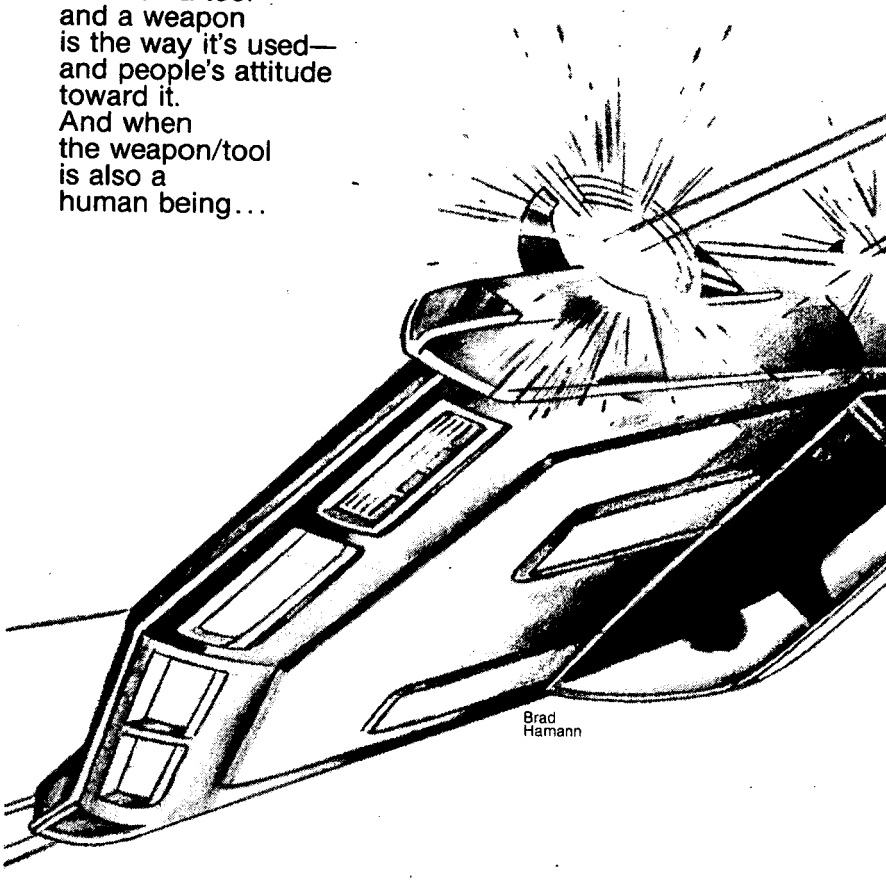
Timothy Zahn

When Jonny Comes Marching Home

The only difference
between a tool
and a weapon
is the way it's used—
and people's attitude
toward it.
And when
the weapon/tool
is also a
human being...



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The late-afternoon sunlight glinted whitely off the distant mountains as the shuttle came to rest with only a slight bounce. Army-issue satchel slung over his shoulder, Jonny Moreau stepped out onto the landing pad, eyes darting everywhere. He had never been all that familiar with Horizon City, but even to him it was obvious the place had changed. There were half a dozen new buildings visible from the Port, and one or two older ones had disappeared. Several of the trees and many of the other nearby plants were imported off-world varieties, clearly holding their own against the native vegetation. But the wind was blowing in from the north, across the plains and forests that were as yet untouched by man, and with it came the sweet-sour aroma Jonny remembered so well from childhood. It was that scent that finally, really convinced him.

He was home.

Taking a deep breath of the perfume, Jonny stepped off the pad and walked the hundred meters to a long, one-story building labeled "Horizon Customs: Entry Point." Opening the outer door, he stepped inside.

A smiling man awaited him by a waist-high counter. "Hello, Mr. Moreau; welcome back to Horizon. I'm sorry—should I call you 'Cee-three Moreau'?"

" 'Mister' is fine," Jonny smiled. "I'm a civilian now."

"Of course, of course," the man said. He was still smiling, but there seemed to be just a trace of tension behind the geniality. "And glad of it, I suppose. I'm Harti Bell, head of customs here. Your luggage is being brought from the shuttle. In the meantime, I wonder if I might inspect your satchel? Just a formality, really."

"Sure." Jonny slid the bag off his shoulder and placed it on the counter, hearing the familiar faint hum from his servos as he did so. Bell took the satchel and pulled, as if trying to move it a few centimeters closer to him. It moved maybe a centimeter; Bell nearly lost his balance. Throwing an odd look at Jonny, he apparently changed his mind and opened the bag where it lay.

By the time he finished, Jonny's two other cases had been brought in. Bell went through them with quick efficiency, made a few notations on an official-looking magcard, and finally looked up again, smile still in place.

"All set, Mr. Moreau," he said. "You're free to go."

"Thanks." Jonny put his satchel over his shoulder once more and transferred the other two bags from the counter to the floor. "Is Transcape Rentals still in business? I'll need a car to get to Cedar Lake."

"Sure is, but they've moved three blocks farther east. Want to call a taxi?"

"Thanks; I'll walk." Jonny held out his right hand. "Thanks a lot."

For just a moment the smile slipped. Then, almost warily, Bell took the outstretched hand. He let go as soon as he politely could.

Picking up his bags, Jonny nodded at Bell and left the building.

Mayor Teague Stillman shook his head tiredly as he hefted the latest land-use proposal from the Cedar Lake city council. He had often thought it impossible for a frontier town of sixteen thousand people to generate as much

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paperwork as Cedar Lake seemed to do. Either official magforms had learned how to breed or else someone was importing them. Whichever, it was probably a Troftian plot.

There was a tap on his open door, and Stillman looked up to see Councilor Sutton Fraser standing in the doorway. "Come on in," he invited.

Fraser did so, closing the door behind him. "Too drafty for you?" Stillman asked mildly as Fraser sat down on one of the mayor's guest chairs.

"I got a call a few minutes ago from Harti Bell out at the Horizon Spaceport," Fraser began without preamble. "Jonny Moreau's back."

Stillman stared at the other for a moment, then shrugged slightly. "He had to come eventually. The war's over, after all. Most of the soldiers came back weeks ago."

"Yeah, but Jonny's not an ordinary soldier. Harti said he lifted a satchel that must have weighed thirty kilos with one hand. Effortlessly. The kid could probably tear a building apart if he got mad."

"Relax, Sut. I know the Moreau family. Jonny's a very even-tempered sort of guy."

"*Was*, you mean," Fraser said darkly. "He's been a Cobra for three years now, killing Trofts and watching them kill his friends. Who knows what that's done to him?"

"Probably instilled a deep dislike for war, if he's like most soldiers. Aside from that, it hasn't done too much, I'd guess."

"You know better than that, Teague. The kid's dangerous; that's a simple fact. Ignoring it isn't going to do you any good."

"Calling him 'dangerous' is? What are you trying to do, start a panic?"

"I doubt that any panic's going to need my help to get started. Everybody in town's seen the idiot plate reports on Our Heroic Forces—they all know how badly the Cobras chewed up the Troft occupation forces on Adirondack and Silvern."

Stillman sighed. "Look. I'll admit there may be some problems with Jonny's readjustment to civilian life. Frankly, I would have been happier if he'd stayed in the service like a lot of the other Cobras did. But he didn't. Like it or not, Jonny's home, and we can either accept it calmly or run around screaming doom. He risked his life for three years; the least we can do is to give him a chance to forget the war and vanish back into the general population."

"Yeah. Maybe." Fraser shook his head slowly. "It's not going to be an easy road, though. Look, as long as I'm here, maybe you and I could draft some sort of announcement about this to the press. Try to get a jump on the rumors."

"Good idea. Hey, cheer up, Sut—soldiers have been coming home ever since mankind started having wars. We should be getting the hang of this by now."

"Yeah," Fraser growled. "Except that this is the first time since swords went out of fashion that soldiers have gotten to take their weapons home with them."

Stillman shrugged helplessly. "It's out of our hands. Come on; let's get to work."

* * *

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Jonny pulled up in front of the modest plastframe house at the edge of town and turned off the car engine with a sigh of relief. The roads between Horizon City and Cedar Lake were rougher than he remembered them, and more than once he'd wished he had spent the extra money to rent a hover, even though the weekly rate was almost double that for wheeled vehicles. But he'd made it, with a minimum of kidney damage, and that was what mattered.

He retrieved his bags from the trunk, and as he set them down on the street a hand fell on his shoulder. He turned and looked five centimeters up into the clearest blue eyes he'd ever known. "Welcome home, Son," the man said.

"Hi, Dader," Jonny said, face breaking into a huge grin as he grasped the other's outstretched hand. "How've you been?"

Pearce Moreau's answer was interrupted by a crash and shriek from the front door of the house. Jonny turned to see his ten-year-old sister Gwen tearing across the lawn toward him, yelling like a banshee with a winning lottery ticket. Dropping into a crouch facing her, he opened his arms wide; and, as she flung herself at him, he grabbed her around the waist, straightened up, and threw her a half meter into the air above him. Her shrill laughter almost masked Pearce's sharp intake of breath. Catching her, Jonny lowered her back to the ground. "Boy, you've sure grown," he told her. "Pretty soon you'll be too big to toss around."

"Good," she panted. "Then you can teach me how to arm wrestle. C'mon and see my room, huh, Jonny?"

"I'll be along in a little bit," he told her. "I want to say hello to Momer first. She in the kitchen?"

"Yes," Pearce said. "Why don't you go on ahead, Gwen. I'd like to talk to Jonny for a moment."

"Okay," she chirped. Squeezing Jonny's hand, she scampered back toward the house.

"She's got her room papered with articles and pictures from the past three years," Pearce explained as he and Jonny collected Jonny's luggage. "Everything she could get hard copies of that had anything to do with the Cobras."

"You disapprove?"

"Of what—that she idolizes you? Good heavens, no. Why?"

"You seem a bit nervous."

"Oh. I guess I was a little startled when you tossed Gwen in the air a minute ago."

"I've been using the servos for quite a while now," Jonny pointed out mildly as they headed toward the house. "I really *do* know how to use my strength safely."

"I know, I know. Hell, I used exoskeleton gear myself in the Minthistin War, you know, when I was your age. But it was pretty bulky, and you couldn't ever forget you were wearing it. I guess . . . well, I suppose I was worried that you'd forget yourself."

Jonny shrugged. "Actually, I'm probably in better control than you ever were, since I don't have to have two sets of responses—with power amplification and without. The servos and ceramic laminae are going to be with me the rest of my life, and I've long since gotten used to them."

Pearce nodded. "Okay." He paused,

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then continued, "Look, Jonny, as long as we're on the subject . . . the Army's letter to us said that 'most' of your Cobra gear would be removed before you came home. What did they—I mean, what do you still have?"

Jonny sighed. "I wish they'd just come out and listed the stuff instead of being coy like that. It makes it sound like I'm still a walking tank. The truth is that, aside from the skeletal laminae and servos, all I have is the fire-control nanocomputer—which hasn't got much to do now except assist with the servos—and two small lasers in my little fingers, which they couldn't remove without amputation. And the servo power supply, of course. Everything else—the arcthrower capacitors, the antiarmor laser, and all the sonic weapons—are gone." So was the power pack's self-destruct capability, but that subject was best left alone.

"Okay," Pearce said. "Sorry to bring it up, but your momer and I were a little nervous."

"That's all right."

They were at the house now. Entering, they went to the bedroom Jonny had shared with his younger brother Jame for most of the last nineteen years. "Where's Jame, by the way?" Jonny asked as he piled his bags by his bed.

"Out at New Persius picking up a spare laser tube for the bodywork welder down at the shop. We've only got one working at the moment and can't risk it going out on us. Parts have been nearly impossible to get lately—a side effect of war, you know." He snapped his fingers. "Say. Those little lasers you have—can you weld with them?"

"I can spot-weld with them, yes. They were designed to work on metals, as a matter of fact."

"Great. Maybe you could give us a hand until we can get parts for the other lasers. How about it?"

Jonny hesitated. "Uh . . . frankly, Dader, I'd rather not. I don't . . . well, the lasers remind me too much of . . . other things."

"I don't understand," Pearce said, a frown beginning to crease his forehead. "You ashamed of what you did? Hell, boy, you should be *proud*. You fought well, protected the Dominion from those invading Troftian devils, and got back alive. That's a record few people can match."

"I'm not ashamed; not really. I mean, I knew pretty much what I was getting into when I joined the Cobras, and I don't really have any regrets. It's just . . . this war was different from yours, Dader. You were on a star ship, fighting the Minthisti in space. You never saw any ground action. You didn't have to infiltrate planets the Trofts had taken and fight them face-to-face. You didn't have to look at the bodies of human civilians who'd been caught in the fighting." Jonny took a deep breath and forced his throat muscles to relax. "I'd just like to try and forget all of that, at least for a while."

Pearce remained silent for a moment. Then he laid a hand on his son's shoulder. "You're right, Jonny, I never had to do anything like that. I'm not sure I can ever understand all of what it meant to you. I'll do my best, though. Okay?"

"Yeah, Dader. Thanks."

"Sure. Come on, let's go see your momer. Then you can go take a look at Gwen's room."

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* * *

Dinner that night was a festive occasion, reminding Jonny of his rare trips back home when he was going to college in New Persius. Irena Moreau had cooked her son's favorite meal—center-fried wild balis—and the conversation was light and frequently punctuated by laughter. The warmth and love seemed to Jonny to fill the room, surrounding the five of them with an invisible defense perimeter. For the first time since his basic training on Asgard he felt truly safe, and tensions he'd forgotten he ever had began to drain slowly from his muscles.

It took most of the meal for the others to bring Jonny up to date on the doings of Cedar Lake's people, so it wasn't until Irena brought out the cahve that conversation turned to Jonny's plans.

"I'm not really sure," Jonny confessed, holding his mug of cahve with both hands, letting the heat soak into his palms. "I suppose I could go back to school and pick up my computer tech certificate. But that would take another year, and I'm not crazy about being a student again. Not now, anyway."

Across the table Jonny's brother Jame sipped cautiously at his mug. "If you went to work, what sort of job would you like?" he asked.

"Well, I'd thought of coming back to the shop with Dader, but you seem to be pretty well settled in there."

Jame darted a glance at his father. "Heck, Jonny, there's enough work in town for three of us. Right, Dader?"

"Sure," Pearce replied with only the barest hesitation.

"Thanks," Jonny said, "but it sounds like you're really too low on equipment for me to be very useful. My thought is that maybe I could work somewhere on my own for a few months until we can afford to outfit the shop for three workers. Then, if there's enough business around, I could come and work for you."

Pearce nodded. "That sounds really good, Jonny. I think that's the best way to do it."

"So back to the original question," Jame said. "What kind of job are you going to get?"

Jonny held his mug to his lips for a moment, savoring the rich, minty aroma. Army cahve had a fair taste and plenty of stimulant, but was completely devoid of the fragrance that made a good scent-drink so enjoyable. "I've learned a lot about civil engineering in the past three years, especially in the uses of explosives and sonic cutting tools. I figure I'll try one of the road construction or mining companies you were telling me about that are working south of town."

"Can't hurt to try," Pearce shrugged. "Going to take a few days off first?"

"Nope—I'll head out there tomorrow morning. I figured I'd drive around town for a while this evening, though; get reacquainted with the area. Can I help with the dishes before I go?"

"Don't be silly," Irena smiled at him. "Relax and enjoy yourself."

"Tonight, that is," Jame amended. "Tomorrow you'll be put out in the salt mines with the rest of the new slaves."

Jonny leveled a finger at him. "Beware the darkness of the night," he said with mock seriousness. "There just may be a pillow out there with your name on it." He turned back to his parents.

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"Okay if I take off, then? Anything you need in town?"

"I just shopped today," Irena told him.

"Go ahead, son," Pearce said.

"I'll be back before it gets too late." Jonny downed the last of his cahve and stood up. "Great dinner, Momer; thanks a lot."

He left the room and headed toward the front door. To his mild surprise, Jame tagged along. "You coming with me?" Jonny asked.

"Just to the car," Jame said. He was silent until they were outside the house. "I wanted to clue you in on a couple of things before you left," he said as they set off across the lawn.

"Okay; shoot."

"Number one: I think you ought to be careful about pointing your finger at people, like you did at me a few minutes ago. Especially when you're looking angry or even just serious."

Jonny blinked. "Hey, I didn't mean anything by that. I was just kidding around."

"*I* know that, and it didn't bother me. Someone who doesn't know you as well might have dived under the table."

"I don't get it. Why?"

Jame shrugged, but met his brother's eyes. "They're a little afraid of you," he said bluntly. "Everybody followed the war news pretty closely out here. They all know what Cobras can do."

"*Could* do. Most of my armament's gone. And even if it wasn't, I sure wouldn't use it on anyone. I'm sick of fighting."

"I know. But they won't know that, not at first. I'm not just guessing here, Jonny; I've talked to a lot of kids since the war ended, and they're pretty nervous about seeing you again. You'd be surprised how many of them are scared that you'll remember some old high school grudge and come by to settle accounts."

"Oh, come on, Jame. That's ridiculous!"

"That's what I tell the ones that ask me about it, but they don't seem convinced. And it looks like some of their parents have picked up on the attitude, too, and—heck, you know how news travels around here. I think you're going to have to bend over backwards for a while, be as harmless as a dove with blunted toenails. Prove to them they don't have to be afraid of you."

Jonny snorted. "The whole thing is silly, but okay. I'll be a good little boy."

"Great." Jame hesitated. "Now for number two, I guess. Were you planning to stop by and see Alyse Carne tonight?"

"That thought *had* crossed my mind," Jonny grinned. "Why? Has she moved?"

"No, she's still living out on Blakeley Street. I just thought that maybe you'd better call before you go over there. To make sure she . . . isn't busy."

Jonny's grin faded. "What are you getting at? She living with someone?"

"Oh, no, it hasn't gone that far," Jame said quickly. "But she's been seeing Doane Etherege a lot lately and—well, he's been calling her his girlfriend."

Jonny nodded slowly. "We'll have to break him of that habit, I guess." He forced a smile. "Don't worry, though; I'll steal her back from him in a civilized manner."

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"Yeah, well, good luck. I'll warn you, though; he's not the drip he used to be."

"I'll keep that in mind." Jonny slid his hand idly along the smooth metal of the car. The idea of a drive into town had lost a lot of its appeal in the past few minutes. Perhaps he should simply stay home.

Jame seemed to sense the indecision. "You still going out?"

Jonny pursed his lips. "Yeah, I think I'll take a quick look around." Opening the door, he slid in and started the engine. "Don't wait up," he added as he drove off.

After all, he told himself firmly, he had not fought Trofts for three years to come home and hide from his own people.

Nevertheless, the trip through Cedar Lake felt more like a reconnaissance mission than the victorious homecoming he had envisioned. He covered most of the town, but stayed in the car and didn't wave or call to the people he recognized. He avoided driving by Alyse Carne's apartment building completely. And he was home within an hour.

For many years the only ground link between Cedar Lake and the tiny farming community to the southwest, Boyar, was a bumpy, one-and-three-quarters-lane permturf road that paralleled the Shard Mountains to the west. It had been considered adequate for so long simply because there was little in or around Boyar that anyone in Cedar Lake would want. Boyar's crops went to Horizon City by way of New Persius; supplies traveled the same route in reverse.

Now, however, all that had changed. A large vein of the cesium-bearing ore pollucite had been rediscovered north of Boyar; and as the mining companies moved in, so did the road construction crews. The facility for extracting the cesium was, for various technical reasons, being built near Cedar Lake, and a multi-lane highway would be necessary to get the ore to it.

Jonny found the road foreman near a large outcrop of granite that lay across the road's projected path. "You Sampson Grange?" he asked.

"Yeah. You?"

"Jonny Moreau. Mr. Oberland told me to check with you about a job. I've had training in lasers, explosives, and sonic blasting equipment."

"Well actually, kid, I—waitaminit. Jonny Moreau the Cobra?"

"*Ex*-Cobra, yes."

Grange shifted his spitstick in his mouth, eyes narrowing slightly. "Yeah, I can use you, I guess. Straight level-eight pay."

That was two levels up from minimum. "Fine. Thanks very much." Jonny nodded toward the granite outcrop. "You need this out of the way?"

"Yeah, but that'll keep. C'mon back here a minute."

He led Jonny to where a group of eight men were struggling to unload huge rolls of pretop paper from a truck to the side of the new road. It took three or four men to handle each roll and they were puffing and swearing with the effort.

"Boys, this is Jonny Moreau," Grange told them. "Jonny, we've got to get this stuff out right away so the truck can go back for another load. Give them a

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hand, okay?" Without waiting for an answer, he strode off.

Reluctantly, Jonny clambered onto the truck. This wasn't exactly what he'd had in mind. The other men regarded him coolly, and Jonny heard the word "Cobra" being whispered to the two or three who hadn't recognized him. Determined not to let it throw him, he stepped over to the nearest roll and said, "Can someone give me a hand with this?"

Nobody moved. "Wouldn't we just be in the way?" one of them, a husky laborer, suggested with more than a little truculence.

Jonny kept his voice steady. "Look, I'm willing to do my share."

"That seems fair," someone else said sarcastically. "It was our taxes that paid to make you into a superman in the first place. And I figure Grange is paying you enough money for four men. So fine; we got the first eight rolls down and you can get the last five. That fair enough, men?"

There was a general murmur of agreement. Jonny studied their faces for a moment, looking for some sign of sympathy or support. But all he saw was hostility, envy, and wariness. "All right," he said softly.

Bending his knees slightly, he hugged the roll of pretop to his chest. Servos whining in his ears, he straightened up and carefully carried the roll to the end of the truck bed. Setting it down, he jumped to the ground, picked it up again and placed it off the road with the others. Then, hopping back into the truck, he went to the next roll.

None of the other workers had moved, but their expressions had changed. Fear now dominated everything else. It was one thing, Jonny reflected bitterly, to watch films of Cobras shooting up Trofts on the plate. It was something else entirely to watch one lift two hundred kilos right in front of you. Cursing inwardly, he finished moving the rolls as quickly as possible and then, without a word, went off in search of Sampson Grange.

He found the other busy inventorying sacks of hardener mix and was immediately pressed into service to carry them to the proper workers. That job led to a succession of similar tasks over the next few hours. Jonny tried to be discreet, but the news about him traveled faster than he did. Most of the workers were less hostile toward him than the first group had been, but it was still like working on a stage, and Jonny began to fume inwardly at the wary politeness and sidelong glances.

Finally, just before noon, he caught on, and once more he tracked down the foreman. "I don't like being maneuvered by people, Mr. Grange," he told the other angrily. "I signed on here to help with blasting and demolition work. Instead, you've got me carrying stuff around like a pack mule."

Grange slid his spitstick to a corner of his mouth and regarded Jonny coolly. "I signed you up at level-eight to work on the road. I never said what you were gonna do."

"That's rotten. You knew what I wanted."

"So what? What the hell—you want special privileges or something? I got guys who have *certificates* in demolition work—I should replace them with a kid

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who's never even seen a real tape on the subject?''

Jonny opened his mouth, but none of the words he wanted to say would come out. Grange shrugged. ''Look, kid,'' he said, not unkindly. ''I got nothing against you. Hell, I'm a vet myself. But you haven't got any training or experience in road work. We can use more laborers, sure, and that super-revved body of yours makes you worth at least two men—that's why I'm paying you level-eight. Other than that, frankly, you aren't worth much to us. Take it or don't; it's up to you.''

''Thanks, but no go,'' Jonny gritted out.

''Okay.'' Grange took out a card and scribbled on it. ''Take this to the main office in Cedar Lake and they'll give you your pay . And come back if you change your mind.''

Jonny took the card and left, trying to ignore the hundred pairs of eyes he could feel boring into his back.

The house was deserted when he arrived home, a condition for which he was grateful. He'd had time to cool down during the drive and now just wanted some time to be alone. As a Cobra he'd been unused to flat-out failure; if the Trofts foiled an attack he had simply to fall back and try a new assault. But the rules here were different, and he wasn't getting the hang of them as quickly as he'd expected to.

Nevertheless, he was a long way yet from defeat. Dialing up last night's newssheet, he turned to the employment section. Most of the jobs being offered were level-ten laborer types, but there was a fair sprinkling of the more professional sort that he was looking for. Settling himself comfortably in front of the screen, he picked up the pad and stylus always kept by the phone and began to make notes.

His final list of prospects covered nearly two pages, and he spent most of the rest of the afternoon making phone calls. It was a sobering and frustrating experience; and in the end he found himself with only two interviews, both for the following morning.

By then it was nearly dinner time. Stuffing the pages of notes into a pocket, he headed for the kitchen to offer his mother a hand with the cooking.

Irena smiled at him as he entered. ''Any luck with the job hunt?'' she asked.

''A little,'' he told her. She had arrived home some hours earlier and had already heard a capsule summary of his morning with the road crew. ''I've got two interviews tomorrow—Svetlanov Electronics and Outworld Mining. And I'm lucky to get even that many.''

She patted his arm. ''You'll find something. Don't worry.'' A sound outside made her glance out the window. ''Your dader and Jame are home. Oh, and there's someone with them.''

Jonny looked out. A second car had pulled to the curb behind Pearce and Jame. As he watched, a tall, somewhat paunchy man got out and joined the other two in walking toward the house. ''He looks familiar, Momer, but I can't place him.''

''That's Teague Stillman, the mayor,'' she identified him, sounding surprised. ''I wonder why he's here.'' Whipping off her apron, she dried her hands and hurried into the living room. Jonny fol-

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lowed more slowly, unconsciously taking up a back-up position across the living room from the front door.

The door opened just as Irena reached it. "Hi, honey," Pearce greeted his wife as the three men entered. "Teague stopped by the shop just as we were closing up and I invited him to come over for a few minutes."

"How nice," Irena said in her best hostess voice. "It's been a long time since we've seen you, Teague. How is Sharene?"

"She's fine, Irena," Stillman said, "although she says *she* doesn't see me enough these days, either. Actually, I just stopped by to see if Jonny was home from work yet."

"Yes, I am," Jonny said, coming forward. "Congratulations on winning your election last year, Mr. Stillman. I'm afraid I didn't make it to the polls."

Stillman laughed and reached out his hand to grasp Jonny's briefly. He seemed relaxed and friendly . . . and yet, right around the eyes, Jonny could see a touch of the caution that he'd seen so often in the road workers. "I'd have sent you an absentee ballot if I'd known exactly where you were," the mayor joked. "Welcome home, Jonny."

"Thank you, sir."

"Shall we sit down?" Irena suggested.

They moved into the living room proper, Stillman and the Moreau parents exchanging small talk all the while. Jame had yet to say a word, Jonny noted, and the younger boy took a seat in a corner, away from the others.

"The reason I wanted to talk to you, Jonny," Stillman said when they were all settled, "was that the city council and I would like to have a sort of 'welcome home' ceremony for you in the park next week. Nothing too spectacular, really; just a short parade through town, followed by a couple of speeches—you don't have to make one if you don't want to—and then some fireworks and perhaps a torchlight procession. What do you think?"

Jonny hesitated, but there was no way to say this diplomatically. "Thanks, but I really don't want you to do that."

Pearce's proud smile vanished. "What do you mean, Jonny? Why not?"

"Because I don't want to get up in front of a whole bunch of people and get cheered at. It's embarrassing and—well, it's embarrassing. I don't want any fuss made over me."

"Jonny, the town wants to honor you for what you did," Stillman said soothingly, as if afraid Jonny was becoming angry.

That thought was irritating. "The greatest honor it could give me would be to stop treating me like a freak," he retorted.

"Son—" Pearce began warningly.

"Dader, if Jonny doesn't want any official hoopla, it seems to me the subject is closed," Jame spoke up unexpectedly from his corner. "Unless you all plan to chain him to the speakers' platform."

There was a moment of uncomfortable silence. Then Stillman shifted in his seat. "Well, if Jonny doesn't want this, there's no reason to discuss it further." He stood up, the others quickly following suit. "I really ought to get home now."

"Give Sharene our best," Irena said.

"I will," Stillman nodded. "We'll

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have to try and get together soon. Goodby, all; and once more, welcome home, Jonny."

"I'll walk you to your car," Pearce said, clearly angry but trying to hide it.

The two men left. Irena looked questioningly at Jonny, but all she said before disappearing back into the kitchen was, "You boys wash up and call Gwen from her room; dinner will be ready soon."

"You okay?" Jame asked softly when his mother had gone.

"Yeah. Thanks for backing me up." Jonny shook his head. "They don't understand."

"I'm not sure I do, either. Is it because of what I said about people being afraid of you?"

"Oh, no, that had nothing to do with it." Jonny sighed. "Look. Horizon is all the way across the Dominion from where the war was fought. You weren't within fifty light-years of a Troft even at their deepest penetration. How can I accept the praise of people who have no idea what they're cheering for? It'd just be going through the motions." He turned his head to stare out the window. "The people of Adirondack had a big ceremony after our Cobra teams forced the Trofts off their planet. There was nothing of duty or obligation about it—when they cheered, you could tell they knew *why* they were doing so. And they also knew who they were there to honor. Not those of us who were on the stage, but those who weren't. Instead of a torchlight procession, they sang a requiem." He turned back to face Jame. "How could I watch Cedar Lake's fireworks after that?"

Jame touched his brother's arm and nodded silently. "I'll go call Gwen," he said a moment later.

Pearce came back into the house. He said nothing, but flashed Jonny a glare that looked to be at least fifty percent disappointment. Then he disappeared into the kitchen. Sighing, Jonny went to wash his hands.

Dinner was very quiet that evening.

The interviews the next morning were complete washouts, with the two prospective employers clearly seeing him just out of politeness. Gritting his teeth, Jonny returned home and dialed up the newssheet once again. He lowered his sights somewhat this time, and his new list came out to be three and a half pages long. Doggedly, he began making the calls.

By the time Jame came to bring him to dinner he had exhausted all the numbers on the list. "Not even any interviews this time," he told Jame disgustedly as they walked into the dining room where the others were waiting. "News really does travel in this town, doesn't it?"

"Come on, Jonny, there has to be *someone* around who doesn't care that you're an ex-Cobra," Jame said.

"Perhaps you should lower your standards a bit," Pearce suggested. "Working as a laborer wouldn't hurt you any."

"Or maybe you could be a patroller," Gwen spoke up. "That would be neat."

Jonny shook his head. "I've tried being a laborer, remember? The men on the road crew were either afraid of me or thought I was trying to show them up."

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"But once they got to know you, things would be different," Irena said.

"Or maybe if they had a better idea of what you'd done for the Dominion they'd respect you more," Pearce added.

"No, Dader." Jonny had tried explaining to his father why he didn't want Cedar Lake to honor him publicly, and the elder Moreau had listened and said he understood. But Jonny doubted that he really did, and Pearce clearly hadn't given up trying to change his son's mind. "I probably would be a good patroller, Gwen," he added to his sister, "but I think it would remind me too much of some of the things I had to do in the army."

"Well, then, maybe you should go back to school," Irena suggested.

"*No!*" Jonny snapped with a sudden flash of anger.

A stunned silence filled the room. Inhaling deeply, Jonny forced himself to calm down. "Look, I know you're all trying to be helpful, and I appreciate it. But I'm twenty-four years old now and capable of handling my own problems." Abruptly, he put down his fork and stood up. "I'm not hungry. I think I'll go out for a while."

Minutes later he was driving down the street, wondering what he should do. There was a brand-new pleasure center in town, he knew, but he wasn't in the mood for large groups of people. He mentally ran through a list of old friends, but that was just for practice; he knew where he really wanted to go. Jame had suggested he call Alyse Carne before dropping in on her, but Jonny was in a perverse mood. Turning at the next corner, he headed for Blakeley Street.

Alyse seemed surprised when he announced himself over her apartment building's security intercom, but she was all smiles as she opened her door. "Jonny, it's good to see you," she said, holding out her hand.

"Hi, Alyse." He smiled back, taking her hand and stepping into her apartment, closing the door behind him. "I was afraid you'd forgotten about me while I was gone."

Her eyes glowed. "Not likely," she murmured . . . and suddenly she was in his arms.

After a long minute she gently pulled away. "Why don't we sit down?" she suggested. "We've got three years to catch up on."

"Anything wrong?" he asked her.

"No. Why?"

"You seem a little nervous. I thought you might have a date or something."

She flushed. "Not tonight. I guess you know I've been seeing Doane."

"Yes. How serious is it, Alyse? I deserve to know."

"I like him," she said, shrugging uncomfortably. "I suppose I started going with him to insulate myself from pain in case you . . . didn't come back: I didn't expect it to grow like it did, though. . . . ." Her voice trailed off.

"You don't have to make any decisions tonight," Jonny said after a moment. "Except whether or not you'll spend the evening with me."

She smiled. "That one's easy. Have you eaten yet, or shall I just make us some calve?"

They talked until nearly midnight, and when Jonny finally left he had recaptured the contentment he'd felt on first arriving at Cedar Lake. Doane Eth-

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erege would soon fade back into the woodwork, he was sure, and with Alyse again at his side, there was nothing he couldn't accomplish. His mind was busy with plans for the future as he let himself into the Moreau house and tiptoed to his bedroom.

"Jonny?" a whisper came from across the room. "You okay?"

"Fine, Jame—just great," Jonny whispered back.

"How is Alyse?"

Jonny chuckled. "Go to sleep, Jame."

"That's nice. Good night, Jonny."

One by one, the great plans crumbled.

With agonizing regularity, employers kept turning Jonny down, and he was eventually forced into a succession of the level-nine and -ten manual jobs he had hoped so desperately to avoid. None of the jobs lasted very long; the resentment and fear of his fellow workers invariably generated an atmosphere of sullen animosity which Jonny found hard to take for more than a few days at a time.

As his search for permanent employment faltered, so did his relationship with Alyse. She remained friendly and willing to spend time with him, but there was a distance between them that hadn't existed before the war. To make matters worse, Doane refused to withdraw gracefully from the field, and aggressively competed with him for Alyse's time and attention.

But worst of all, from Jonny's point of view, was the unexpected trouble his problems had brought upon the rest of the family.

His parents and Jame, he knew, could stand the glances, whispered comments, and mild stigma that went with being related to an ex-Cobra. But it hurt him terribly to watch Gwen retreat into herself from the half-unintentional cruelty of her peers. More than once Jonny considered leaving Horizon and returning to active service, freeing his family from the cross-fire he had put them into. But to leave now would be to admit defeat, and that was something he couldn't bring himself to do.

And so matters precariously stood for three months, until the night of the accident. Or the murder, as some called it.

Sitting in his parked car, watching the last rays from the setting sun, Jonny let the anger and frustration drain out of him and wondered what to do next. He had just stormed out of Alyse's apartment after their latest fight, the tenth or so since his return. Like the job situation, things with Alyse seemed to be getting worse instead of better. Unlike the former, he could only blame himself for the problems in his love life.

The sun was completely down by the time he felt capable of driving safely. The sensible thing would be to go home, of course. But the rest of the Moreau family was out to dinner, and the thought of being alone in the house bothered him for some reason. What he needed, he decided, was something that would completely take his mind off his problems. Starting the car, he drove into the center of town where the Raptopia, Cedar Lake's new pleasure center, was located.

Jonny had been in pleasure centers on three other worlds while in the army, and by their standards the Raptopia was

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decidedly unsophisticated. There were fifteen rooms and galleries, each offering its own combination of sensual stimuli for customers to choose from. The choices seemed limited, however, to permutations of the traditional recreations: music, food and drink, mood drugs, light shows, games, and thermal booths. The extreme physical and intellectual ends of the pleasure spectrum, personified by prostitutes and professional conversationalists, were conspicuous by their absence.

Jonny wandered around for a few minutes before settling on a room with a loud music group and wildly flickering light show. Visibility under such conditions was poor, and as long as he kept his distance from the other patrons, he was unlikely to be recognized. Finding a vacant area of the contoured softfloor, he sat down.

The music was good, if dated—he'd heard the same songs three years ago in the pleasure centers on Asgard—and he began to relax as the light and sound swept like a cleansing wave over his mind. So engrossed did he become that he didn't notice the group of teen-aged kids that came up behind him until one of them nudged him with the tip of his shoe.

"Hi there, Cobra," he said as Jonny looked up. "What's new?"

"Uh, not much," Jonny replied cautiously. There were seven of them, he noted: three girls and four boys, all dressed in the current teen-age styles so deplored by Cedar Lake's more conservative adults. "Do I know you?"

The girls giggled. "Naw," another of the boys drawled. "We just figured everybody ought to know there's a celebrity here. Let's tell 'em, huh?"

Slowly, Jonny rose to his feet to face them. From his new vantage point he could see that all seven had the shining eyes and rapid breathing of heavy stim-drug users. "I don't think that's necessary," he said.

"You want to fight about it?" the first boy said, dropping into a caricature of a fighting stance. "C'mon, Cobra. Show us what you can do."

Wordlessly, Jonny turned and walked toward the door, followed by the giggling group. As he reached the exit the two talkative boys pushed past him and stood in the doorway, blocking it.

"Can't leave 'til you show us a trick," one said.

Jonny looked him in the eye, successfully resisting the urge to bounce the smart-mouth off the nearest wall. Instead, he picked up both boys by their belts, held them high for a moment, and then turned and set them down to the side of the doorway. A gentle push sent them sprawling onto the softfloor. "I suggest you all stay here and enjoy the music," he told the rest of the group as they stared at him with wide eyes.

"Turkey hop," one of the smart-mouths muttered. Jonny ignored the apparent insult and strode from the room, confident that they wouldn't follow him. They didn't.

But the mood of the evening was broken. Jonny tried two or three other rooms for a few minutes each, hoping to regain the relaxed abandonment he'd felt earlier. But it was no use, and within a quarter hour he was back outside the Raptopia, walking through the cool

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night air toward his car, parked across the street a block away.

He had covered the block and was just starting to cross the road when he became aware of the low hum of an idling car nearby. He turned to look back along the street—and in that instant a car rolling gently along the curb suddenly switched on its lights and, with a squeal of tires, hurtled directly toward him.

There was no time for thought or human reaction, but Jonny had no need of either. Acting with a will of its own, his body launched itself into a flat, ten-meter dive that took him to the walkway on the far side of the street. He landed on his right shoulder, rolling expertly to absorb the impact, but crashed painfully into a building before he could stop completely. The car roared past; and as it did so two needles of light flashed from Jonny's little fingers to the car's two right-hand tires. The double blowout was audible even over the engine noise. Instantly out of control, the car swerved violently, bounced off two parked cars, and finally crashed broadside into the corner of a building.

Aching all over, Jonny got to his feet and ran to the car. Ignoring the gathering crowd, he worked feverishly on the crumpled metal, and had the door open by the time a rescue unit arrived. But his effort was in vain. The car's driver was already dead, and his passenger died of internal injuries on the way to the hospital.

They were the two teen-aged boys who had accosted Jonny in the Raptopia.

The sound of his door opening broke Mayor Stillman's train of thought, and he turned from his contemplation of the morning sky in time to see Sutton Fraser closing the door behind him. "Don't you ever knock?" he asked the city councilor irritably.

"You can stare out the window later," Fraser said, pulling a chair close to the desk and sitting down. "Right now we've got to talk."

Stillman sighed. "Jonny Moreau?"

"You got it. It's been over a week now, Teague, and the tension out there's not going down. People in my district are still asking why Jonny's not in custody."

"We've been through this, remember? The legal department in Horizon City has the patroller report; until they make a decision we're treating it as self-defense."

"Oh, come on. You know the kids would have swerved to miss Jonny. That's how that stupid turkey hop is played—okay, okay, I realize Jonny didn't know that. But did *you* know he fired on the car *after* it had passed him? I've got no less than three witnesses now that say that."

"So have the patrollers. I'll admit I don't understand that part. Maybe it's something from his combat training."

"Great," Fraser muttered.

Stillman's intercom buzzed. "Mayor Stillman, there's a Mr. Vanis D'arl to see you," his secretary announced.

Stillman glanced questioningly at Fraser, who shrugged and shook his head. "Send him in," Stillman said.

The door opened and a slender, dark-haired man entered and walked toward the desk. His appearance, clothing, and walk identified him as an offworlder

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before he had taken two steps. "Mr. D'arl," Stillman said as he and Fraser rose to their feet, "I'm Mayor Teague Stillman; this is Councilor Sutton Fraser. What can we do for you?"

D'arl produced a gold ID pin. "Vanis D'arl, representing the Central Committee of the Dominion of Man." His voice was slightly accented.

Out of the corner of his eye, Stillman saw Fraser stiffen. His own knees felt a little weak. "Very honored to meet you, sir. Won't you sit down?"

"Thank you." D'arl took the chair Fraser had been sitting in. The councilor moved to a seat farther from the desk, possibly hoping to be less conspicuous there.

"This is mainly an informal courtesy call, Mr. Stillman," D'arl said. "However, all of what I'm going to tell you is to be considered confidential Dominion business." He waited for both men to nod agreement before continuing. "I've just come from Horizon City, where all pending charges against Reserve Cobra-Three Jonny Moreau have been ordered dropped."

"I see," Stillman said. "May I ask why the Central Committee is taking an interest in this case?"

"Cee-three Moreau is still technically under army jurisdiction, since he can be called into active service at any time. Hence our authority."

"Are you familiar with the incident that Mr.—uh, Cee-three Moreau was involved in?"

"Yes, and I understand the doubts both you and the planetary authorities have had about the circumstances. However, Moreau cannot be held responsible for his actions at that time. He was under attack and acted accordingly."

"His combat training is that strong?"

"Not precisely." D'arl hesitated. "I dislike having to tell you this, as it has been a military secret up until recently. But you need to understand the situation. Have you ever wondered what the name 'Cobra' stands for?"

"Why . . ." Stillman floundered, caught off guard by the question. "I assumed it referred to the Terran snake."

"Only secondarily. It's an acronym for 'Computerized Body Reflex Armament.' I'm sure you know about the ceramic laminae on Moreau's bones and the servo network connected to it, as well as the various weapon systems. You may also know about the nanocomputer implanted just under his brain. This is where the . . . problem . . . originates.

"You must understand that a soldier, especially a guerrilla in enemy-held territory, needs a good set of combat reflexes if he is to survive. Training can give him some of what he needs, but this takes a long time and has its limits. Therefore, since a computer was going to be necessary for equipment monitoring and fire control anyway, a set of combat reflexes was also programmed in."

Stillman's eyes narrowed. "What exactly are you implying, Mr. D'arl?"

"I am *saying*, not implying, that Moreau will react instantly, and with very little conscious control, to any deadly attack launched at him. In this particular case the pattern shows clearly that this is what happened. He evaded the initial attack, but was left in a vulnerable position—off his feet and away

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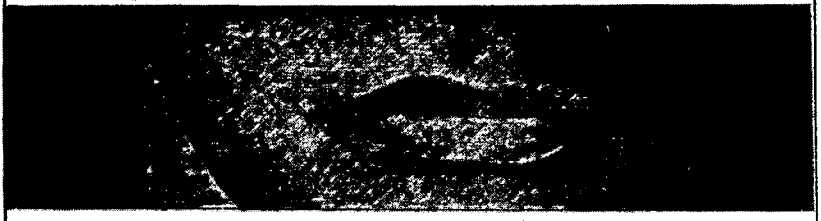

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from cover—and was thus forced to counterattack. Without specific programming his computer didn't know how to disable the car and so aimed, by default, for the wheels. Part of its job is to monitor the weapon systems, so it knew the metalwork lasers were all it had left. So it used them."

A deathly silence filled the room. "Let me get this straight," Stillman said at last. "The Army made Jonny Moreau into an automated fighting machine who will react lethally to anything that even *looks* like an attack? And then let him come back to us without making any attempt to change that?"

"The system was designed to defend a soldier in enemy territory," D'arl said. "It's not nearly as hair-trigger as you seem to imagine. And as for 'letting' him come back like that, there was no other choice. The computer cannot be reprogrammed or removed without risking brain damage."

"What the *hell!*" Fraser had apparently forgotten he was suppose to be courteous to Dominion representatives. "What damn idiot came up with *that* idea?"

D'arl turned to face the councilor. "The Central Committee is tolerant of criticism, Mr. Fraser." His voice was even, but had an edge to it. "But your tone is unacceptable."

Fraser refused to shrivel. "Never mind that. How did you expect us to cope with him when he reacts to attacks like that?" He snorted. "*Attacks*. Two kids playing a game!"

"Use your head," D'arl snapped. "We couldn't risk having a Cobra captured by the Trofts and sent back to us with his computer reprogrammed. The Cobras were soldiers, first and foremost, and every tool and weapon they had made perfect sense from a military standpoint."

"Didn't it occur to anyone that the war would be over someday? And that the Cobras would be going home to civilian life?"

"Less powerful equipment might well have cost the Dominion the war, and would certainly have cost many more Cobras their lives. At any rate, it's done now, and you'll just have to learn to live with it like everyone else."

Stillman frowned. " 'Everyone else?' How widespread is this problem?"

D'arl turned back to face the mayor, looking annoyed that he'd let that hint slip out. "It's not good," he admitted. "We tried to keep as many Cobras as possible in the service after the war, but all were legally free to leave and several hundred did so. Most of those are having trouble of one kind or another. We're trying to help them, but it's difficult to do. People are afraid of them, and that hampers our efforts."

"Can you do anything to help Jonny?"

D'arl shrugged slightly. "I don't know. He's an unusual case, in that he came back to a small home town where everyone knew what he was. I suppose it might help to move him to another planet, maybe give him a new name. But people would eventually find out. Cobra strength is hard to hide for long."

"So are Cobra reflexes," Stillman nodded grimly. "Besides, Jonny's family is here. I don't think he'd like leaving them."

"That's why I'm not recommending his relocation, though that's the usual procedure in cases like this," D'arl said.

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"Most Cobras don't have the kind of close family support he does. It's a strong point in his favor." He stood up. "I'll be leaving Horizon tomorrow morning, but I'll be within a few days' flight of here for the next month. If anything happens I can be reached through the Dominion governor-general's office in Horizon City."

Stillman rose from his chair. "I trust the Central Committee will be trying to come up with some kind of solution to this problem."

D'arl met his gaze evenly. "Mr. Stillman, the government is far more concerned about this situation than even you are. You see one minor frontier town; we see seventy worlds. If an answer exists, we'll find it."

"And what do we do in the meantime?" Fraser asked heavily.

"Your best, of course. Good day to you."

Jame paused outside the door, took a single deep breath, and knocked lightly. There was no answer. He raised his hand to knock again, then thought better of it. After all, it was *his* bedroom, too. Opening the door, he went in.

Seated at Jame's writing desk, hands curled into fists in front of him, Jonny was staring out the window. Jame cleared his throat.

"Hello, Jame," Jonny said, without turning.

"Hi." The desk, Jame saw, was covered with official-looking magforms. "I just dropped by to tell you that dinner will be ready in about fifteen minutes." He nodded at the desk. "What're you up to?"

"Filling out some college applications."

"Oh. Decided to go back to school?"

Jonny shrugged. "I might as well."

Stepping to his brother's side, Jame scanned the magforms. University of Rajput, Bomu Technical Institute on Zimbwe, University of Aerie. All off-planet. "You're going to have a long way to travel when you come home for Christmas," he commented. Another fact caught his eye: all three applications were filled out only up to the space marked *Military Service*.

"I don't expect to come home very often," Jonny said quietly.

"You're just going to give up, huh?" Jame put as much scorn into the words as he could.

It had no effect. "I'm retreating from enemy territory," Jonny corrected mildly.

"The kids are dead, Jonny. There's nothing in the universe you can do about it. Look, the town doesn't blame you—no charges were brought, remember? So quit blaming yourself. Accept the fact of what happened and let go of it."

"You're confusing legal and moral guilt. Legally, I'm clear. Morally? No. And the town's not going to let me forget it. I can see the disgust and fear in people's eyes. They're even afraid to be sarcastic to me any more."

"Well . . . it's better than not getting any respect at all."

Jonny snorted. "Thanks a lot," he said wryly. "I'd rather be picked on."

A sign of life at last. Jame pressed ahead, afraid of losing the spark. "You know, Dader and I have been talking about the shop. You remember that we

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didn't have enough equipment for three workers?''

''Yes—and you still don't.''

''Right. But what stops us from having *you* and Dader run the place while *I* go out and work somewhere else for a few months?''

Jonny was silent for a moment, but then shook his head. ''Thanks, but no. It wouldn't be fair.''

''Why not? That job used to be yours. It's not like you were butting in. Actually, I'd kind of like to try something else for a while.''

''I'd probably drive away all the customers if I was there.''

Jame's lip twisted. ''That won't fly, and you know it. Dader's customers are there because they like him and his work. They don't give two hoots who handles the actual repairs as long as Dader supervises everything. You're just making excuses.''

Jonny closed his eyes briefly. ''And what if I am?''

''I suppose it doesn't matter to you right now whether or not you let your life go down the drain,'' Jame gritted. ''But you might take a moment to consider what you're doing to Gwen.''

''Yeah. The other kids are pretty hard on her, aren't they?''

''I'm not referring to them. Sure, she's lost most of her friends, but there are a couple who're sticking by her. What's killing her is having to watch her big brother tearing himself to shreds.''

Jonny looked up for the first time. ''What do you mean?''

''Just what I said. She's been putting up a good front for your sake, but the rest of us know how much it hurts her to see the brother she adores sitting in his room and—'' He groped for the right words.

''Wallowing in self-pity?''

''Yeah. You owe her better than that, Jonny. She's already lost most of her friends; she deserves to keep her brother.''

Jonny looked back out the window for a long moment, then glanced down at the college magforms. ''You're right.'' He took a deep breath, let it out slowly. ''Okay. You can tell Dader he's got himself a new worker,'' he said, collecting the magforms together into a neat pile. ''I'll start whenever he's ready for me.''

Jame grinned and gripped his brother's shoulder. ''Thanks,'' he said quietly. ''Can I tell Momer and Gwen, too?''

''Sure. No; just Momer.'' He stood up and gave Jame a passable attempt at a smile. ''I'll go tell Gwen myself.''

The tiny spot of bluish light, brilliant even through the de-contrast goggles, crawled to the edge of the metal and vanished. Pushing up the goggles, Jonny set the laser down and inspected the seam. Spotting a minor flaw, he corrected it and then began removing the fender from its clamps. He had not quite finished the job when a gentle buzz signaled that a car had pulled into the drive. Grimacing, Jonny took off his goggles and headed for the front of the shop.

Mayor Stillman was out of his car and walking toward the door when Jonny emerged from the building. ''Hello, Jonny,'' he smiled, holding out his hand with no trace of hesitation. ''How are you doing?''

''Fine, Mr. Stillman,'' Jonny said, feeling awkward as he shook hands.

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He'd been working here for three weeks now, but still didn't feel comfortable dealing directly with his father's customers. "Dader's out right now; can I help you with something?"

Stillman shook his head. "I really just dropped by to say hello to you and to bring you some news. I heard this morning that Wyatt Brothers Contracting is putting together a group to demolish the old Lamplighter Hotel. Would you be interested in applying for a job with them?"

"No, I don't think so. I'm doing okay here right now. But thanks for mentioning—"

He was cut off by a dull thunderclap. "What was that?" Stillman asked, glancing at the cloudless sky.

"An explosion," Jonny said curtly, eyes searching the southwest sky for evidence of fire. For an instant he was back on Adirondack. "A big one, southwest of us. There!" He pointed to a thin plume of smoke that had suddenly appeared.

"The cesium extractor, I'll bet," Stillman muttered. "Damn! Come on, let's go."

The déjà vu vanished. "I can't go with you," Jonny said.

"Never mind the shop. No one will steal anything." Stillman was already getting into his car.

"But—" There would be *crowds* there! "I just can't."

"This is no time for shyness," the mayor snapped. "If that blast really *was* all the way over at the extraction plant, there is probably one hell of a fire there now. They might need our help. Get *in*, damn it!"

Jonny obeyed. The smoke plume, he noted, was growing darker by the second.

Stillman was right on all accounts. The four-story cesium extraction plant was indeed burning furiously as they roared up to the edge of the growing crowd of spectators. The patrollers and firemen were already there, the latter pouring a white liquid through the doors and windows of the building. The flames, Jonny saw as he and the mayor pushed through the crowd, seemed largely confined to the first floor. The *entire* floor was burning, however, with flames extending even a meter or two onto the ground outside the building. Clearly, the fire was being fueled by one or more liquids.

The two men had reached one of the patrollers now. "Keep back, folks—" he began.

"I'm Mayor Stillman," Stillman identified himself. "What can we do to help?"

"Just keep back—no, wait a second, you can help us string a cordon line. There could be another explosion any time and we've got to keep these people back. The stuff's over there."

The "stuff" consisted of thin, bottom-weighted poles and bright red cord to string between them. Stillman and Jonny joined three patrollers who were in the process of setting up the line.

"How did it happen?" Stillman asked as they worked, shouting to make himself heard over the roar of the flames.

"Witnesses say a tank of iaphanine got ruptured somehow and ignited," one of the patrollers shouted back. "Before they could put it out the heat set off another couple of tanks. I guess they had a few hundred kiloliters of the

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damned stuff in there—it's used in the refining process—and the whole lot went up at once. It's a wonder the building's still standing."

"Anyone still in there?"

"Yeah. Half a dozen or so—third floor."

Jonny turned, squinting against the light. Sure enough, he could see two or three anxious faces at a partially open third-floor window. Directly below them Cedar Lake's single "skyhooker" fire truck had been driven to within a cautious ten meters of the building and was extending its ladder upwards. Jonny turned back to the cordon line—

The blast was deafening, and Jonny's built-in reflexes reacted by throwing him flat on the ground. Twisting around to face the building, he saw that a large chunk of wall a dozen meters from the working firemen had been disintegrated by the explosion. In its place was now a solid sheet of blue-tinged yellow flame. Fortunately, none of the firemen seemed to have been hurt.

"Oh, hell," a patroller said as Jonny scrambled to his feet. "Look at that."

A piece of the wall had apparently winged the skyhooker's ladder on its way to oblivion. One of the uprights had been mangled, causing the whole structure to sag to the side. Even as the firemen hurriedly brought it down the upright snapped, toppling the ladder onto the ground.

"Damn!" Stillman muttered. "Do they have another ladder long enough?"

"Not when it has to sit that far from the wall," the patroller gritted. "I don't think the Public Works talltrucks can reach that high either."

"Maybe we can get a hover-plane from Horizon City," Stillman said, a hint of desperation creeping into his voice.

"They haven't got time." Jonny pointed at the second-floor windows. "The fire's already on the second floor. Something has to be done right away."

The firemen had apparently come to the same conclusion and were pulling one of their other ladders from its rack on the skyhooker. "Looks like they're going to try to reach the second floor and work their way to the third from inside," the patroller muttered.

"That's suicide," Stillman shook his head. "Isn't there any place they can set up airbags close enough to let the men jump?"

The answer to that was obvious and no one bothered to voice it: if the firemen could have done that, they would have already done so. Clearly, the flames extended too far from the building for that to work.

"Do we have any strong rope?" Jonny asked suddenly. "I'm sure I could throw one end of it up to them."

"But they'd slide down into the fire," Stillman pointed out.

"Not if you anchored the bottom end fifteen or twenty meters away; tied it to one of the fire trucks, say. Come on, let's go talk to one of the firemen."

They found the fire chief in the group trying to set up the new ladder. "It's a nice idea, but I doubt if all of the men up there could make it down a rope," he frowned after Jonny had sketched his plan. "They've been in smoke and terrific heat for nearly a quarter hour now and are probably getting close to collapse."

"Do you have anything like a breeches

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buoy?" Jonny asked. "It's like a sling with a pulley that slides on a rope."

The chief shook his head. "Look, I haven't got any more time to waste here. We've got to get our men inside right away."

"You can't send men into that," Stillman objected. "The whole second floor must be on fire by now."

"That's why we have to hurry, damn it!"

Jonny fought a brief battle with himself. But, as Stillman had said, this was no time to be shy. "There's another way. I can take a rope to them along the *outside* of the building."

"What?" "How?" the chief and Stillman asked simultaneously.

"You'll see. I'll need at least thirty meters of rope, a pair of insulated gloves, and about ten strips of heavy cloth. *Now!*"

The tone of command, once learned, was not easily forgotten. Nor was it easy to resist; and within a minute Jonny was climbing up the ladder the firemen had placed on the second-floor window ledge. The rope, tied firmly around his waist, trailed behind him, kept just taut enough to stay out of the flames.

It was a lot hotter than Jonny had expected it to be, but he pushed onward, reaching the window without any obvious burns. A fresh blast of heat greeted him as his head topped the ledge. Clearly, the second floor was uninhabitable. Climbing the last few rungs quickly, Jonny stepped onto the ledge and moved to its farthest edge where the wall—hot though it was—provided him some protection from the blast-furnace effect.

Twisting his head, he looked up. Two meters above him was his target window. This kind of vertical jump was tricky—it was easy to add in too much horizontal component—but he knew how to do it. Carefully flexing his knees, he leaped and caught the ledge, pulling himself over it and through the half-open window in one smooth motion.

The fire chief's guess about the heat and smoke had been correct. The seven men lying or sitting on the floor of the small room were so groggy they weren't even startled by Jonny's sudden appearance. Three were already unconscious. A quick check showed they were alive, but just barely. He would have to move fast.

The first task was to get the window completely open. It was designed, Jonny saw, to only open halfway, the metal frame of the upper section firmly joined to the wall. The pane itself was an unbreakable plastic which would, nevertheless, probably yield to a Cobra-strength kick. But that would leave jagged edges, something Jonny didn't want. So instead of breaking the window, he turned his lasers onto the frame. A few carefully placed shots into the heat-softened metal did the trick, and a single kick popped the pane neatly and sent it tumbling to the ground.

Moving swiftly now, Jonny untied the rope from his waist and fastened it to a convenient stanchion, tugging three times on it to alert the firemen below to take in the slack. Hoisting one of the unconscious men to a more or less vertical position, he tied a strip of cloth to the man's left wrist, tossed the other end over the slanting rope, and tied it to the man's right wrist. With a quick glance

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outside to make sure the firemen were ready, he lifted the man through the window and let him slide down the taut rope into the waiting arms of the firemen. Jonny didn't wait to watch them cut him loose, but went immediately to the second unconscious man.

Parts of the floor were beginning to smolder by the time the last man disappeared out the window. Tossing one more cloth strip over the rope, Jonny gripped both ends with his right hand and jumped. The wind of his passage felt like an arctic blast on his sweaty skin and he found himself shivering as he reached the ground. Letting go of the cloth, he stumbled a few steps away—and heard a strange sound.

The crowd was cheering.

He turned to look at them, wondering, and finally it dawned on him that they were cheering for *him*. Unbidden, an embarrassed smile crept onto his face, and he raised his hand shyly in acknowledgement.

And then Mayor Stillman was at his side, gripping Jonny's arm and smiling broadly. "You did it, Jonny; you did it!" he shouted over the all the noise.

Jonny grinned back. With half of Cedar Lake watching he'd saved seven men, and had risked his life doing it. They'd seen that he wasn't a monster, that his abilities could be used constructively and—most importantly—that he *wanted* to be helpful. Down deep, he could sense that this was a potential turning point. Maybe—just maybe—things would be different for him now.

Stillman shook his head sadly. "I really thought things would be different for him after the fire."

Fraser shrugged. "I'd hoped so, too. But I'm afraid I hadn't really counted on it. Even while everybody was cheering for him you could see that nervousness still in their eyes. That fear of him was never gone, just covered up. Now that the emotional high has worn off that's all that's left."

"Yeah." Lifting his gaze from the desk, Stillman stared for a moment out the window. More and more lately the office had begun to feel like a prison cell, to the point where he sometimes half-expected to see bars on the window. "So they treat him like an incurable psychopath. Or a wild animal."

"You can't really blame them. They're scared of what his strength and lasers could do if he went berserk."

"He doesn't *go* berserk, damn it!" Stillman flared, slamming his fist down on the desk.

"*I* know that!" the councilor shot back. "Fine—so you want to tell everyone the truth? Even assuming Vanis D'arl didn't jump down our throats for doing it, would you *really* want to tell people Jonny has no control whatsoever over his combat reflexes? You think that would help?"

Stillman's flash of anger evaporated. "No," he said quietly. "It would just make things worse." He stood up and walked over to the window. "Sorry I blew up, Sut. I know it's not your fault. It's just . . ." He sighed. "We've lost it, Sut. That's all there is to it. We're never going to get Jonny reintegrated into this town now. If becoming a bona fide hero didn't do it, then I have no idea what else to try."

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"It's not your fault either, Teague. You can't take it personally." Fraser's voice was quiet. "The government had no business doing what it did to Jonny, and then dropping him on us without any preparation. The Cobras were a new breed of soldier and *someone* should have recognized there were going to be special problems when they came home. Obviously, no one did. But they're not going to be able to ignore the problem. You remember what D'arl said—the Cobras are having trouble all over the Dominion. Sooner or later the government's going to have to do something about it. We've done our best; it's up to them now."

Stillman's intercom buzzed. Walking back to his desk, the mayor tapped the key. "Yes?"

"Sir, Mr. Do-sin just called from the press office. He says there's something on the DOM-Press line that you should see."

"Thank you." Sitting down, Stillman turned on his plate and dialed the proper channel. The last three news items were still visible, the top one marked with a star, indicating its importance. Both men hunched forward to read it.

DOMINION JOINT MILITARY COMMAND HQ, ASGARD:

A MILITARY SPOKESMAN ANNOUNCED TODAY THAT ALL RESERVE COBRAS WILL BE RECALLED INTO ACTIVE SERVICE BY THE END OF NEXT MONTH. THIS MOVE IS DESIGNED TO COUNTER A MINTHISTIN BUILD-UP ALONG THE DOMINION'S ANDROMEDA BORDER. AS YET NO REGULAR ARMY OR FLEET RESERVES ARE BEING RECALLED, BUT ALL OPTIONS ARE BEING KEPT OPEN.

"I don't believe it," Fraser shook his head. "Are those damn Minthisti going to try it *again?* I thought they learned their lesson the last time we stomped them."

Stillman didn't reply.

Vanis D'arl swept into Mayor Stillman's office with the air of a man preoccupied by more important business. He nodded shortly at the two men who were waiting there for him and sat down without invitation. "I trust this is as vital as your message implied," he said to Stillman. "I postponed an important meeting to detour to Horizon. Let's get on with it."

Stillman nodded, determined not to be intimidated, and gestured to the youth sitting quietly by his desk. "May I present Jame Moreau, brother of Cobra-Three Jonny Moreau. He and I have been discussing the Reserve call-up set for later this month in response to the alleged Minthistin threat."

"Alleged?" D'arl's voice was soft but there was a warning under it.

Stillman hesitated, suddenly aware of the risk they were taking with this confrontation. But Jame stepped into the gap. "Yes, *alleged*. We know this whole thing is a trumped-up excuse to pull all the Cobras back into the service and ship them off to the border where they'll be out of the way."

D'arl looked keenly at Jame, as if seeing him for the first time. "You are concerned about your brother, of course; that's only natural," he said at last. "But your allegations are unprovable

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and come perilously close to sedition. The Dominion makes war only in self-defense. Even if your claim was true, what would such an action gain us?"

"That is precisely our point," Jame said calmly, showing a self-control and courage far beyond his nineteen years. "The government is trying to solve the Cobra problem, clearly. But this isn't a solution; it's merely a postponement."

"And yet, the Cobras were generally unhappy in their new civilian roles," D'arl pointed out. "Perhaps this will actually be better for them."

Jame shook his head, his eyes still holding D'arl's. "No. Because you can't hold them there forever, you see. You either have to release them again someday—in which case you're right back where you started—or else you have to hope that the problem will . . . work itself out."

D'arl's face was an expressionless mask. "What do you mean by that?"

"I think you know." For just a second Jame's control cracked, and some of the internal fire leaked out. "But don't you see? It won't *work*. You can't kill off all the Cobras, no matter how many wars you put them through, because the Army will be making new ones as fast as the old ones die. They're just too damn useful for the brass to simply drop the project."

D'arl looked back at Stillman. "If this is all you wanted, to throw out ridiculous accusations, then you've wasted my time. Good day to you." He stood up and headed toward the door.

"It isn't," Stillman said. "We think we've come up with an alternative."

D'arl stopped and turned back to face them. For a moment he measured them with his eyes, then slowly came and sat down again. "I'm listening."

Stillman leaned forward in his chair, willing calmness into his mind. Jonny's life was riding on this. "The Cobra gear was designed to give extra speed, weaponry, and reflexes to its owners; and according to Jame here, Jonny told him that the original equipment included vision and auditory enhancers as well." D'arl nodded once, and Stillman continued, "But warfare isn't the only area where these things would be useful. Specifically, how about new planet colonization?"

D'arl frowned, but Stillman hurried on before he could speak. "I've done some reading on this in the last few weeks, and the usual procedure seems to involve four steps. First, an initial exploration team goes in to confirm the planet is habitable. Then a more extensive scientific party is landed for more tests; after that you usually need a pre-colony group to go in with heavy machinery for clearing land and starting settlements. Only then does the first main wave of colonists arrive. The whole process takes a year or more and is very expensive, mainly because you need a small military base there the whole time to protect the explorers from unknown dangers. That means feeding a few hundred men, transporting weapons and lots of support gear—"

"I know what it involves," D'arl interrupted. "Get to your point."

"Sending in Cobras instead of regular soldiers would be easier and cheaper," Stillman said. "Their equipment is self-contained and virtually maintenance-free, and they can both act as guards and help with the other work. True, a

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Cobra probably costs more to equip than the soldiers and workers he'll replace—but you've already *got* the Cobras."

D'arl shook his head impatiently. "I listened this long because I hoped you might have come up with something new. The Central Committee considered this same idea months ago. Certainly, it would save money—but only if you've got some place to use it. There are no more than a half-dozen habitable worlds left within our borders and all have had a preliminary exploration. We are hemmed in on all sides by alien empires; to gain more worlds we would have to go to war for them."

"Not necessarily," Jame said. "We could go *past* the aliens."

"What?"

"Here's what we had in mind," Stillman said. "The Trofts just lost a war to us, and they know that we're still strong enough to really tear into their empire if we decided to invade. So it shouldn't be too hard to talk them into ceding us a corrider of space through their territory, for non-military transport only. All the charts show there's at least *some* unclaimed space on the far side of their territory; that's where we set up the colony."

D'arl was gazing into space, a thoughtful look on his face. "What if there aren't any habitable planets out there?"

"Then we're out of luck," Stillman admitted. "But if there *are*, look at what you've gained. New worlds, new resources, maybe new alien contacts and trade—it would be a far better return on the Cobra investment than you'd get by killing them off in a useless war."

"Yes. Of course, we'd have to put the colony far enough past the border that the Trofts wouldn't be tempted to sneak out and destroy it. With that kind of long-distance transport, using Cobras instead of an armor battalion makes even more sense. We'd still need to give it enough armament to defend itself . . . ." He pursed his lips. "And as the colony gets stronger it should help keep the Trofts peaceful—they know better than to start a two-front war. The Army might be interested in that aspect."

Jame leaned forward. "Then you agree with us? You'll suggest this to the Central Committee?"

Slowly, D'arl nodded. "I will. It makes sense and is potentially profitable for the Dominion—a good combination. I'm sure the . . . trouble . . . with the Minthisti can be handled without the Cobras." Abruptly, he stood up. "I expect both of you to keep silent about this," he cautioned. "Premature publicity would be harmful. I can't make any promises; but whatever decision the committee makes will be quick."

He was right. Less than two weeks later the announcement was made.

The big military shuttle was surrounded by a surprisingly large crowd, considering that only twenty-odd people would be accompanying Jonny from Horizon to the new colonist training center on Asgard. At least ten times that many people were at the Port, what with family, friends, and general well-wishers seeing the emigrants off. Even so, the five Moreaus and Stillman had little trouble working their way through the mass. For some it seemed to be fear that

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moved them out of the way of the red and black diamond-patterned Cobra dress uniform; but for others—the important ones—it was genuine respect. Pioneers, Jonny reflected, probably had a different attitude toward powerful men than the general populace. Not really surprising; it was on just those men that their lives would soon be depending.

"Well, Jonny, good luck," Stillman said as they stopped near the inner edge of the crowd. "I hope things work well for you."

"Thanks, Mr. Stillman," Jonny replied, gripping the mayor's outstretched hand firmly. "And thanks for—well, for your support."

"You'll write before you leave Asgard, won't you?" Irena asked, her eyes moist.

"Sure, Momer." Jonny hugged her. "Maybe in a couple of years you'll all be able to come out and visit me."

"Yeah!" Gwen agreed enthusiastically.

"Perhaps," Pearce said. "Take care, son."

"Watch yourself, Jonny," Jame seconded.

And with another round of hugs it was time to go. Picking up his satchel, Jonny stepped aboard the shuttle, pausing once on the steps to wave before entering. The shuttle was empty, but even as he chose a seat the other colonists began coming in. Almost, Jonny thought, as if his boarding had been the signal they'd been waiting for.

That thought brought a bittersweet smile to his lips. From social outcast in his own home town to a leader on a new world! Few men were ever granted a new chance like this one, and he knew well he'd never receive another. But that was all right. Where they were going there were only two options: success or death. And for Jonny, either was preferable to failure.

Still smiling, he leaned back in his seat and waited peacefully for takeoff. ■

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BRASS TACKS

Dear Stan,

In his June 22 review column, "The Mutants Are Coming!" Spider Robinson thanks me for my indulgence, after taking the time to communicate his feeling for the downing of "gentle, funny Moondog Johnny." But I wasn't indulging him; he was speaking for me.

Spider's reviews are so good because he puts himself into them.

Thanks, Spider.

DENNIS SCHMIDT

Columbus, OH

I agree. We'll miss those reviews. . . .

Dear Dr. Schmidt:

This is the first fan letter I have written to *Analog* since it was *Astounding*. What brings me out of the tent is Dean McLaughlin's *Dawn*, and some thoughts it prompts about the state of science fiction—its past, its present, and where it might be going.

It began with the announcement in "In Times To Come." The news that a four-part reprise on Asimov's "Nightfall" was in the offing prompted me to haunt newsstands for the succeeding installments in a spirit of expectancy, as if we were not in the Eighties but in the Forties. Pretty soon, as McLaughlin's narrative and descriptive power became evident, I was following the story for its own sake, not just as a "Nightfall" variant.

The closing installment was somewhat disappointing, as so much book-length SF unfortunately is; he had built so well toward the historical, religious, and personal climax in the eclipse that when it came it faded just a little. I felt rather the way you do watching a classical music concert on TV (with typical TV audio), when the orchestra swells to the full or the diva hits a high "C," and the monitoring engineer cuts back on the gain so that the sound level actually goes *down*. Or maybe the author intended it that way? So that our hero Isak, who looks for a while slated to be a religious/secular leader like Mohammed, and then for a while seems booked for a Christian crucifixion, ends up instead making his bargain with the worldly powers—like Luther with his protector Duke Frederick, and even showing a streak of Machiavelli? Did McLaughlin intend disappointment in the reader, that Isak does not rise to the full moral grandeur of the historical occasion?

Still, when you think about it, it's a

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considerably more optimistic tale than "Nightfall." In the Good Doctor's classic, organized social rationality pits itself against traditionalist fanaticism—and the fanatics turn out to be right. In McLaughlin's variation on the theme, the rationality of a lone individual, abetted by power-seeking revolutionaries, pits itself against socially organized fanaticism—and, save for Isak's self-preservative "Eminence" gambit at the end, the rational prediction wins. (Although I did find myself wondering—just what, after the myth-making process has time to take hold of it, will be the religious status of that newborn child?)

On the whole, then, the social/historical message for 1981 seems to be a good deal more progressive and optimistic than that for 1941. "Dawn" tells us of a political, religious, and (ultimately) scientific revolution, all coming to pass during one eclipse and totally destroying a regime that is straight out of the Dark Ages. "Nightfall" describes a modern, metropolitan, rational society undergoing a single eclipse that sends it *back* to the Dark Ages, with the further depressing thought that this is going to happen over and over again, world without end, Amen.

We *have* come a long way since 1941.

I was further reminded of how far we have come since 1941 by a live-theater performance of "Nightfall" by faculty members from Tucson's Pima Community College, in the University of Arizona planetarium this spring. (A planetarium is a *marvelous* place to stage "Nightfall"; not only do you have a ready-made set for action in an observatory, but when the mob storms the observatory at the climax you can have people actually banging on the auditorium doors behind the audience.) The cast were from Physics, Humanities, Biological Sciences, English, Speech, and Psychology, a rare and heartening example of academic specialists working together in a good cause; and they were both male and female. Therefore, the newspaper reporter and a senior and a junior astronomer were played by women. It added a richness of dramatic interplay that would have been lost by sticking to 1941's males-only assumptions—and it "worked," in the show-business meaning of that word. Re-reading "Nightfall" afterward—to which the play's dialogue was remarkably faithful—I found myself thinking, "Of *course*, that brash young newshound has to be a type like Lois Lane."

The program notes for the play took account of Dr. Asimov's well-founded umbrage at being told that "Nightfall" was his "best" story. No writer alive and well in 1981 likes to be told he hit his peak forty years ago. Nevertheless, the cast for the show enthusiastically concluded, "There *is* something 'special' about 'Nightfall'!" I think so too, without the slightest put-down of the Good Doctor, and so evidently does Dean McLaughlin.

But I also think your questionnaire results published four months ago (April 1981) help to explain how science fiction has grown to encompass both "Nightfall" and *Dawn*. We now have more readers over 65 than under 18, and more longterm readers than new readers. That, for science fiction, is a startling change; remember the old charge that it was "kid stuff"? Instead, we have a literature which has traditions, conventions, and a history, like any other. We also have people who are encountering "Nightfall" for the first time, in dialectical interplay with people who remember "Nightfall" from the first time around. And so we can have

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a *Dawn*. Greg Benford, at one of those university conferences on science fiction—and some of them, I'd suggest to reviewer Tom Easton, *are* worth attending—remarked that "The pulps are our scriptures"; and when you freely read and interpret scriptures all kinds of things can happen, including revolutions and reformations.

However, a disquieting thought: Do the results of your questionnaire imply a "generational" hypothesis about *Analog* and its readers—not so much the old stereotype of the perennial crop of teenage fans, but rather a single age-group that was virtually born with the magazine, grew up with it, matured with it, and is now aging with it? No wonder you are worried about the problem of attracting new readers, against the competition of the 1940s-style SF that is the prevailing style on television and in the movies!

PAUL A. CARTER
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The author replies:

I want to thank the historian of Little America for his kind words, both here and elsewhere. As for the matter of disappointment, I can only hope he is in the minority. I would point out that while most of us have heard of (Martin) Luther, I at least am not sure who this Duke Frederick guy was. For that matter (and perhaps to coin a phrase), who was King of France under Voltaire? Those who control the world rarely change it.

DEAN MCLAUGHLIN

Gentlefolk:

I'd like to see some straightforward speculation on what a society without money (and its associated businesses) would be like. Remember Fred Pohl's idea of "negative poverty"? The "poor" in his projected future America were overburdened with money they *had* to spend and goods they *had* to consume. Well, what would be the next step toward a money-less society? Would something else take the place of money? Would anything *have* to?

I've heard argument that money-trading costs too much and might be regarded as parasitic, or nonproductive, in a rationalized industrial economy. (Shades of Technocracy and the Townsend Plan, or Social Credit!)

Is barter the *only* alternative? One can well understand why the Bolshevik attempt to do without money failed: not enough prior education of the Great Unwashed, for the big factor. But suppose a society had developed without the idea of money? Could it have done without that "technology," or is such an economic feature essential to a technologically based society?

Correspondence welcome. Speculative writers please note; there aren't many economics-based SF stories about, are there?

NORMAN MCKINNEY
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100 Bain Avenue
Toronto, Ontario
Canada M4K 1E8

Actually, there've been quite a few—by Mack Reynolds, for example—but there's plenty of room for more.

Dear Mr. Schmidt:

I agree wholeheartedly with the opinion you expressed in the lead-in to "Brass Tacks" (May 1981). There *is* too much "either-one-opinion-or-the-other," emotionalism in lieu of rationality, among the ecology/progress debaters. Do ecology and progress have to be mutual antagonists? Nothing gripes me more than to see the Fusion people and the Wildlife people going at each

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other tooth and nail when both have basically the same goals: a clean, safe energy/environment. You want to yell at somebody, folks, take on the oil companies. They need it.

But I am ashamed of *Analog* for even printing words like those of Stine and Goehner.

"If the loss of whales means man's survival, then by all means kill, destroy." Mr. Goehner is fortunate that he was not within my range when he uttered that idiotic statement, or he would by now be more familiar with killing and destruction than he would ever care to be. Even as a hypothetical statement, it was as ridiculous as it was offensive. Man's survival *cannot* be achieved by the destruction of another species. Not only would this be disastrous from the food-chain point of view—even mosquitoes are necessary in there somewhere—but, as Sherry Cole pointed out, the parasite dies once it's killed its host. Humans are parasites on their planet host, whether you like it or not.

That is simple logic, which I expect anyone to be able to understand. My major objection is more complex, an exercise in ethics and morality, which I do not expect people like Stine and Goehner and Pothoof to ever understand.

The human race has no god-given right to exterminate another species in the name of its own survival.

The Cetaceans (dolphins and whales) are, for the most part, more intelligent than humans. *Much* more intelligent. (And yes, I can prove that, but it involves a great deal of evidence and I do not intend to take the time and space unless someone asks.) It is a monstrous conceit, if not a monstrous evil, to take the life of an intelligent and utterly nonaggressive being, for *any* purposes. We consider it barbaric to kill and eat another human, to use his bones for tools and decoration. How, then, can humans presume to kill other intelligent beings? We speak of the human "right" to life. But humans treat the life of a sperm whale with no more respect than they do a fly's. How can a species which believes its own lives sacred sanction the killing of a peaceful, superior one?

If a species has *any* right to kill, they have the right to kill within their own species. To flaunt that as humans do is an act of supreme arrogance—or insanity.

Is this the use to which humans put their much-vaunted intelligence? That, in the name of their individual survival, they are entitled to wipe out any species which cannot, or (more importantly) *will* not, fight back?

Survival of the fittest be damned. They *could* have denied us the ocean from the very beginning, if they'd wanted to. But they haven't.

Think about it.

DIAN L. HARDISON
Ensign, U.S. Navy
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Virginia Beach VA 23456

1. Analog does not try to suppress alternate views—especially in The Alternate View and Brass Tacks.

2. It's not terribly hard to imagine a plausible situation in which our survival is dependent on destroying another species. (No, I'm not saying the whales are such a case.) Such a situation would indeed pose an interesting ethical dilemma, and it would be very interesting to see how you'd handle it.

3. All species are not equally indispensable to food chains and ecological webs. So far we've gotten along quite well without Tyrannosauri, and I, for one, am not even particularly worried about the loss of smallpox virus.

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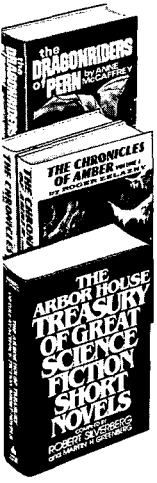
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